THE IRON TRADE REVIEW

VOLUME XXVIII. CLEVELAND, O. SEPTEMBER 19, 1895. CHICAGO, ILL. NUMBER 38.

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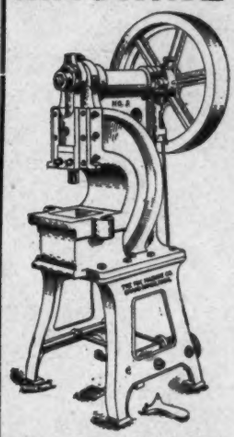

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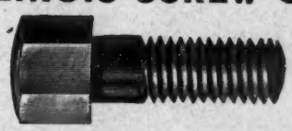

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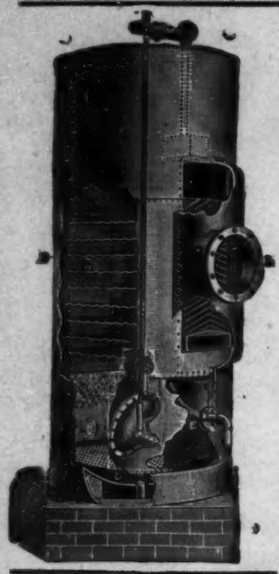

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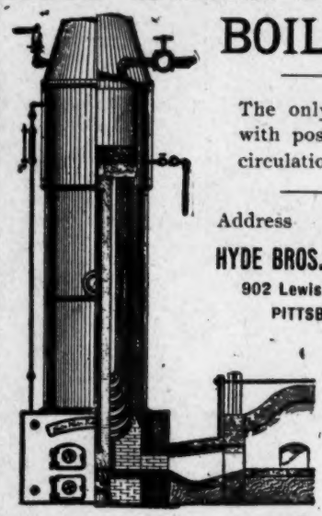

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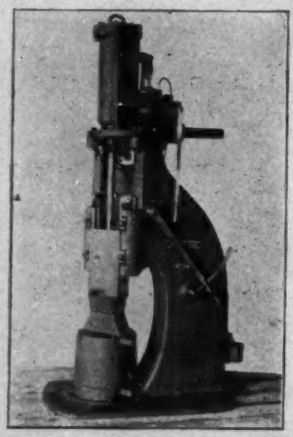

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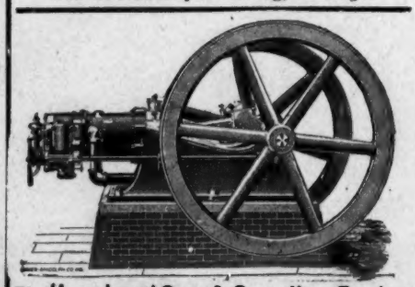

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THE IRON TRADE REVIEW

VOLUME XXVIII. CLEVELAND, O. SEPTEMBER 19, 1895. CHICAGO, ILL. NUMBER 38.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

After two weeks of only moderate activity in iron, so far as new demand for raw and finished material is concerned, the trade is questioning whether the limit of the advance has been reached. The heavy production of pig iron Sept. 1—a yearly rate of 11,000,000 tons, according to one set of blast furnace figures, and of 10,000,000 tons, by the Eastern statistics, suggests that some of the reserves talked about three months ago, in discussioas of prices, have at last got in line. Whether unsold stocks shall begin to grow again will be decided by the ability of the country to continue to use up iron at a weekly rate of 200,000 tons. The probability of foreign material putting a stop to the advance on this side is less imminent, since prices abroad have gone up. On Bessemer iron, foreign quotations have advanced $1.25 and $1.50 in the past few weeks. In the week just ended there have been evidences of weakness in Bessemer at Pittsburg, but whether this is only the result of maneuvering for position by large buyers, and will be succeeded by fresh advances carrying the price to a new notch, or whether it is notice that the limit of high prices has been reached, will be determined in the near future. The significant fact developed is that some large purchases of metal with deliveries running well into next year are under discussion. In the transactions of the past week some Bessemer iron was sold through second hands at $17, Pittsburg, for delivery early in 1896, but it does not appear that buyers' talk of the possibility of delivering Eastern iron, from foreign ores, at $16.80 Pittsburg has led producers in near-by districts to meet that basis. However, $16.50 at valley furnace, for the first quarter of 1896, has been quoted freely. On spot sales and 1895 deliveries the range has been from $17 down to $16.75 in the valley. The question of Bessemer ore supply has had serious consideration in the week, in view of the certainty, after a careful canvass of the situation, that a shortage of several hundred thousand tons would occur on Marquette ore sold for this year's delivery. It is known that a part of this has been provided for, a few producers of standard Bessemers finding that they can get out somewhat more ore than they had counted on. Some sales have already been made to furnacemen short on their Marquette ores, and $4.25 and $4.50 have been paid for standard Bessemer hematites and $4.75 and upward is the basis for specular Bessemer. Thus far the Connellsville coke strike is in the meeting and rumor stage, with indications that there will be nothing more serious in it at present. Coke operators are in so nearly the same position in the matter of contracts that there is no special incentive for any single concern to encourage the strike for the purpose of securing uniform action on prices. The East reports that last week showed good demand for everything that can be used for steel making and that sales known to be for considerable amounts were more carefully guarded than usual, there being especially heavy deals for basic pig and for Bessemer made from Cornwall and foreign ores. This week Philadelphia reports less activity, but with a strong undertone, giving promise of further advance under additional buying. Chicago has been quieter than for several weeks, but the feature of going business is the large percentage of it that can be traced to railroad wants. Central Western steel markets are waiting. The basis of current buying is $24.75, Pittsburg, but both sides of the market are seeking more positive developments before making large engagements that run far into the new year. Finished material holds prices firmly, though the amount of new business closed is not yet up to calculations for early fall. Old contracts keep mills of every description so hard-run, and order books are so well filled that there is no pushing to get more tonnage on them.

THE CLEVELAND DISTRICT.

The important development of the week in iron ore was the definite announcement by Marquette range mines whose men are now in the tenth week of their strike, that it would be impossible for them to make full shipments on their contracts for Bessemer ores. In view of the hardship likely to result to certain furnacemen who had depended upon Marquette ores to make up their necessary quota, the matter was taken up by ore firms who were parties to the early spring agreement concerning old-range Bessemers. It was found that a few mines would be able to get out more ore than they had counted on, and these will undertake to supply in part the wants of furnacemen who are short. This, it is estimated, will provide for something over half the shortage, which amounts in all to several hundred thousand tons. Whether there will ultimately be an absolute shortage, after all shifts have been made, including larger percentages of Mesabi, and other alterations in mixtures, cannot be forecast. Some sales have already been made, in accordance with the new arrangement, and $4.25 to $4.50 is the basis for No. 1 Bessemer hematite and $4.75 to $5 for hard ores. The question of lake freights figures not a little in the case, and it is questionable if higher than $1.25 will be paid on ore included in the new contracts. There is too little tonnage involved to induce ore shippers to push up freights on themselves, on ore yet to come down for which the early spring prices were secured. There is special hardship in the situation to Marquette shippers. In addition to the loss of business from the strike, much of their contract tonnage has run out and they are compelled in many cases to pay nearly a 50 per cent advance for wild tonnage to move stockpile ore sold at low prices. In the past week there have been further sales of Mesabi ore at $1.25 a ton above early sales, and inquiries are plentiful. The steady movement of non-Bessemer ores that have been on the dock one, two and three years, is another feature of the situation.

Pig Iron.

The Bessemer pig iron market has presented some peculiar phases of late, and it has been necessary to distinguish between metal offered through second hands and that sold by producers. Quotations on the former have been made in Cleveland at $16.65 delivered, or $16 in the valley. At Pittsburg some sales have been made by brokers at $17, for the first quarter of 1896, equal to $16.35 in the valley. At the same time valley furnaces ask $16.50 on iron for 1896 delivery,

Continued on page 7.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

There is an unmistakable lull in the iron market for raw and finished material and it is evident that most if not all of the largest buyers in this territory have covered their requirements at least for some time. The Minerva furnace, at Milwaukee, Wis., has been leased to the Illinois Steel Co., and as soon as it can be put into working order will run on Bessemer iron. The advance in steel rails has been expected for some time, as the fact that billets have been selling for some time at higher prices than rails, was an irregularity which the market foresaw would require correction. Rails are now $29 in round lots. Calumet furnace will make iron this week as full blast was turned on Sept. 15. The new company has appointed Rogers, Brown & Co. sales agents. Soft steel continues in fair demand and the sales of billets foot up about 10,000 tons. Nearly all the larger orders placed during the week for finished material, were from consumers whose business is largely connected with railroads. Miscellaneous buying has been quieter than of late and the quietness more noticeable by contrast. The 40c advance in Southern pig iron freight is now in effect and quotations have been changed accordingly.

PIG IRON.—Local iron is in moderate demand and a few lots of several hundred tons have been booked. The very fact that furnaces making coke iron in this vicinity are not soliciting new business, speaks more to the point than could any mere statement made in market columns. Lake Superior charcoal iron has been active and several transactions of 500 tons are noted, as well as orders for smaller quantities—all at full quotations. Southern coke iron has been quieter, but the fact that the large purchases of basic pig iron will necessitate a change, as some of those now on foundry and forge grades will have to be placed on basic, will further cramp deliveries, and will cause a restriction in production. Already a peculiar feature has developed within the week. No. 1 and No. 2 soft are selling at practically the same prices. Some agents of Ohio furnaces have received instructions that buyers of silveries are to assume all advances in freight rates during the life of the contract, and sellers will give the benefit of any decline in same. Should any large inquiries come up between now and Oct. 1, the situation as to scarcity of iron would be more clearly shown than is now generally suspected.

Lake Sup. Charcoal	$14 50@15 50	Southern No. 2 Soft	$ @13 90
Local Coke Fdy. No. 1	14 00@15 00	South'n Silveries No. 1	15 25@15 75
Local Coke Fdy. No. 2	13 50@14 50	South'n Silveries No. 2	@15 15
Local Coke Fdy. No. 3	@13 00	Jackson Co. Silveries	15 50@16 00
Local Scotch Fdy. No. 1	14 00@14 50	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. No. 2	14 00@14 50	Ohio Silveries No. 2	14 50@15 00
Local Scotch Fdy. No. 3	12 50@13 00	Ohio Strong Softeners	15 00@15 50
South'n Coke No. 2	@14 00	Alabama Car Wheel	17 00@17 50
South'n Coke No. 3	@13 65	Malleable Bessemer	
Southern No. 1 Soft	@14 15	Coke Bessemer	

BARS.—Remain firm and in active demand. Mills are much crowded with orders, having work ahead for several months. Inquiry is good for varying amounts up to and for 1,000 tons—a very large share of it being for railroad purposes. Quotations are steady: Common iron, 1.50c to 1.55c; guaranteed iron, 1.60c to 1.65c; soft steel bars from strictly billet stock, 1.65c to 1.75c.

BILLETS AND RODS.—The sales of billets foot up some 10,000 tons at $26@$26.50. Rods are firm at $35 mill. There is considerable inquiry, but no sales of any importance.

RAILS AND TRACK SUPPLIES.—Standard sections are now quoted at $29 for round quantities and up to $32.50 for small lots from stock. Demand for light rails is excellent and the steel company is not pushing sales on account of the condition of its order books. Other quotations are: splice bars, 1.50c to 1.55c; track bolts, 2.25c to 2.45c; spikes, 1.95c to 2c.

STRUCTURAL MATERIAL.—Demand is only moderate in the building line, and there is less work in sight for the near future. A good tonnage is reported for bridges and viaducts. This latter constitutes the bulk of the business here. Metropolitan Elevated will probably let 400 tons this week for a viaduct at Rebecca and 16th streets. Beams and channels, 1.90c to 2c; angles, 1.85c to 1.90c; plates, 2.10c to 2.20c; tees, 2c to 2.10c. Small lots from stock are ¼ to ½c higher.

PLATES.—Orders during the week from mill have ranged light, but warehouse business has improved in the carload line to the interior. Tank steel, 2.15c to 2.25c; flange steel, 2.45c to 2.55c; firebox steel, 2.85c to 5c; boiler tubes, 60 to 65 per cent discount.

MERCHANT STEEL.—Carriage and wagon makers are in the market for season's supply of tire steel and the run of business from them has been good. Mill agents are very firm in their attitude as regards prices. Open-hearth spring, tire and machinery steel, 2.10c to 2.20c; smooth finished machinery steel, 1.85c to 1.90c; smooth finished tire, 1.80c to 1.85c; tool steel, 5.50c to 7.50c; specials, 11c and upwards; Bessemer bars, 1.60c to 1.65c.

SHEETS.—There is a better demand for late delivery—November, and some mills have secured a fair tonnage of black sheets at 2.95c@3c and sheet steel 3c@3.05c for No. 29. Galvanized sheets are still active from mill at 70 per cent off.

OLD RAILS AND WHEELS.—Iron rails continue in good demand and 1,000 tons were sold by a railroad at $18.67½ with a few lesser quantities at $19@$19.25. Steel rails in lots of 500 tons have been active at $15@$15.50. Car wheels are moving in a small way at $12@$13.

SCRAP.—Some little irregularity is noted in quotations. Several dealers are asking from $1 to $2 higher than as given here, but as they report few sales, the higher prices may account for it. General demand is moderate only. Railroad forge, $15.50 to $16; dealer's forge, $13.50 to $14; No. 1 mill, $11; heavy cast, $12 to $12.50; axles, $18; cast borings, $6.75 to $7; wrought turnings, $8.25 to $8.50; axle turnings, $9 to $9.25; mixed steel, $12 to $12.50; stove plates, $6.50 to $7; heavy melting steel, $13.50 to $14.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg.

As far as actual transactions go, the pig iron market has been comparatively quiet the past week. Some options on Bessemer iron taken last week were not closed and there is thought to be some connection between this fact and the sale from second hands of several small lots of Bessemer iron at a price considerably below what producers were willing to accept. The iron so offered was quickly taken up, but did not seem to affect the market. The price in most cases was $17, Pittsburg. There is a report of an Eastern purchase of Bessemer by the leading interest here, and it is also rumored that foreign ores are being arranged for, and that Bessemer pig produced therefrom on the seaboard will be shipped to Pittsburg. Some sales of Bessemer for delivery in the last quarter of the year have been made at $17.40, $17.50 and $17.65, Pittsburg, but only a moderate total is involved. There are evidences that considerable buying is ahead and that the apparent weakness of Bessemer in the past week has a bearing on coming transactions. The view

that the limit has been reached finds little acceptance with the average seller. Foundry iron has been only moderately active and quotations are as last given—$14.50 for No. 1 and $14 for No. 2. Gray forge has sold at $13.20 in the valley and the very limited amount to be had from valley and Western Pennsylvania furnaces is held at $13.50, with 65c freight added to Pittsburg. In addition to the further sales of Southern basic pig to the Carnegie Steel Co., practically duplicating their initial order, it is reported that 10,000 tons have been sold to the Apollo Iron & Steel Co. The billet market has been quiet, with little steel selling. We quote the market at $24.75 and $25. A 1,500-ton sale at the former price is reported, October delivery, and one of 5,000 tons at the same price, delivery in January and February. Finished material is less active, though the mills are getting out an enormous tonnage. Railroad buying is in evidence in numerous directions, and mills anticipate an enlargement of this demand. In structural material the pressure on the mills for deliveries is stronger as the end of the favorable building season approaches. We quote 1.65c as minimum for beams and channels and 1.65c for angles; for tank steel 1.90c. Some demand for iron plate is noted in view of the high price of steel. All kinds of scrap materials are in good demand and show slight advances. Reports from the Connellsville coke region are still indefinite, but the chances are not good for a general strike. Indeed doubts are expressed of the ability of the agitators to secure a suspension of work at any important point.

Cincinnati. The business of the week has been in the aggregate heavy. There has not been a heavy tonnage in the usual foundry grades of coke irons, but there has been a great run of ordinary orders, embracing all classes and grades of pig iron, indicating a general activity throughout the country. The comparative high price of Bessemer and its scarcity, has given great impetus to the trade in basic pig iron, and large blocks have been placed during the week. Charcoal irons have enjoyed an enlarged business, and the charcoal iron markets have advanced their prices accordingly. The freight rates from the South advanced on the 15th 50 cents per ton to Ohio and Mississippi river points. The extraordinary demand for Bessemer and basic pig, has invited numerous furnaces hitherto strangers to anything but the usual foundry grades into the production of these irons for steel purposes, and curtails proportionately the supply of foundry and ordinary mill grades. Stocks at the furnaces have been going off steadily and rapidly until the unsold stocks of coke irons to-day in all grades represent but about two weeks' supply at even present rate of consumption, and should the general activity reasonably anticipated by many, materialize, a famine in pig iron may be realized. There are successful men in the trade who feel that the advances that have obtained have been somewhat excessive and predict a reaction; some others entertain the view that so far the advances have been warranted and healthy, but that higher prices would invite foreign competition and increase importations.

Buffalo. The most noticeable feature to report from this district is that the jobbing foundries have at last been able to obtain a much needed advance in the price of castings. When the first advance in pig iron was reported, the malleable iron works and foundries running on specialties made a corresponding advance in their castings; but the foundries running on jobbing work have not been able until recently to obtain any benefit from pig iron contracts at old figures. A contract for cars is noticed this week, the order being taken by a concern in the vicinity of Buffalo, and it is understood one or two large contracts are in view. Lake Superior charcoal has advanced about $1 per ton for immediate delivery, and owing to the advance in lake freights an extra dollar per ton is charged to offset extended delivery and the increase in the cost of delivering at lake ports. The scarcity of soft iron both from the South and from the Mahoning and Shenango valleys is more noticeable, and an advance in No. 1 and No. 2 Ohio soft iron is reported.

Good Work on Low Phosphorus Pig Iron.

Since the recent remodeling of the 14′x65′ stack of the Carbon Iron & Steel Co., at Parryville, Carbon Co., Pa., it has been doing good work in the production of low-phosphorus pig of the "Viking" and "Vasa" brands. The original furnace was built in 1869 and at that time was fully up to "modern" standards; but the improvements of 25 years left much to be attained, and the declining demand for low phosphorus pig last year afforded the opportunity for renewal. The shell of the furnace is 31′ 6″ in diameter, and it was lined up solid to the shaft. In the remodeling this lining was all taken out and piers built to brace the shaft and carry the in-wall. This made it possible to retain the lines of the stack by keeping it cool, thus preventing the cutting that had been noticed in the old furnace. There are seven tuyeres, eight rows of Gayley bronze coolers, and three Cowper stoves.

The best week's output thus far has been 817½ tons, of which 532 tons was 1x, 243 tons 2x and 42½ tons gray forge. The best day's output was 143 tons. Lowest average fuel consumption, through a week was 2,080 pounds, half coke and half anthracite. The following analyses of the iron are of interest. They are not selected, but taken at random from the past two weeks' work:

Silicon.	Phosphorus.	Sulphur.	Grade.
.507	.021	.016	2x
.249	.021	.023	2x
.296	.023	.019	2x
.239	.019	.017	1x
.225	.019	.016	2x
.385	.023	.019	1x
.253	.020	.025	G. F.
.206	.020	.030	G. F.
.391	.020	.025	2x
.314	.019	.019	2x
.526	.024	.022	1x
.696	.026	.015	1x
.80	.026	.012	2x

The lowest phosphorus thus far was .017 as reported by A S. McCreath, of Harrisburg. The ore is foreign, brought over about two years ago. The plant at Parryville is in charge of H. R. Hall, superintendent.

Stove Foundries and the Advance in Iron.

The proposition to advance prices of stoves sold in the remaining months of '95 has been under consideration by Eastern manufacturers recently and varying views have come from the trade on the subject. The advances in pig iron are given as the reason for putting up the price of stoves. Yet much of the 1895 product of stove works was made from pig iron bought at the low prices of 1894 and the early part of the present year and therefore did not have to stand the heavy advances of the past five months. Black & Germer, extensive manufacturers of stoves at Erie, Pa., report that they will not advance prices this season. Their orders were taken very largely in the spring and early summer months. While a large number of new orders are yet to come in from their customers they will accept these at the prices made early in the season. They are looking forward to a healthy and moderately active fall business, of larger volume than in 1894.

THE Chandler Iron Co. continues ore shipments, though the force of men employed on the stock piles has been cut down, the night shift being laid off. There remains about 16,000 tons of Chandler ore yet in stock and 11,000 tons of Long Lake. The company will nearly, if not quite clean up the former before navigation closes, but the latter, or a good share of it will remain over to another season. This company is now employing about 400 men and is raising 1,000 tons of ore per day.—[Ely, Minn., Times.

THE IRON TRADE REVIEW

DEVOTED TO
IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.
PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND:
27 VINCENT STREET.
A. I. FINDLEY, Editor.

CHICAGO:
1142 MONADNOCK BLOCK.
B. M. GARDNER, Associate Editor and Western Manager.

ENTERED AT THE POST OFFICE IN CLEVELAND, O., AS SECOND CLASS MATTER

SEPTEMBER 19, 1895.

TOOL-MAKING AND MONEY-MAKING.

An abundance of labor-saving tools, up-to-date and generally expensive, is essential, in ordinary thinking, to the most economical shop production. The *American Machinist*, in an article describing the equipment—or lack of it—of the Chicago Skein & Axle Co.'s Grand Crossing plant, gives some testimony to the contrary. This company makes cast-iron "thimble-skeins" for wagon axles from iron costing .75 to .8 cents in the ladle, poured in four-part and five-part flasks, machines the castings, making good fit of the nuts and threads and sells them at 1.45 cents a pound. Of the cheapness of these castings the writer says:

The Gates Iron Works make some rough castings as low as 1½ cents per pound, but they are heavy pieces and poured o anything that will run. In speaking of this job the Gates manager said the Gates shops would not care to supply gray iron work of any description whatever for less than a cent and a half. Mr. Craver, of Craver & Steel, who have a very excellently equipped foundry at Harvey, Ill., a few miles south of Grand Crossing, said his house would not make gray iron in any form for 1.45 cents, nor, he added, would he care to buy at that price; thus indicating 1.45 as about his idea of the long cost of simple gray iron castings. 1.75 is a not unusual price for heavy machine castings, involving considerable core work, and 2 cents and 2½ cents is very often paid for plain gray iron castings of rather small weights; 2¼ cents being considered a very close price. There is a great gulf fixed between 2¼ cents per pound selling price for small gray iron work in plain forms, and 1.45 cents per pound for five-part flask work, machined.

The equipment of the foundry and machine shop is referred to in detail. The establishment has been in operation for many years. Its foundry has practically none of the modern contrivances that facilitate handling and save labor. The machine shop, with its "floor of parting sand" and windows coated with foundry dust, and tools of the rudest description, is as far from the average conception of "well equipped" as one could find. Yet good work is turned out and money is made for the proprietors. The explanation, as given in the words of the superintendent is this:

"The trouble with you New England fellows is that you want so much stuff to do with that you eat up all there is in the job paying your tool makers. Out West here we have got no use for that kind of superintendents; we want a man who can get out work at low prices, and leave something for the proprietor. You may be all right on some work, but I do not know what it is; I have been around a good deal, and I never saw a job yet where the Western man would not beat the Eastern men out every time. You know too much about tool making and not enough about making money; we do not care a pin for the tools, the work is what we are after; we get it, and we do it, and we are taking it away from the East, and we will keep on taking it away until your Eastern tool makers get a new crop of ideas."

Certainly a heretical speech, when set beside the teaching of approved mechanical authorities. But there is one question which neither the writer of the article nor the superintendent raises: "How much larger would be the profits and how much better the work in this establishment if the speeds of modern equipment were added to the evident efficiency of the organization and supervision of to-day?" The point established is that expensive tools can be dispensed with; not that the best tools are not money-makers.

JULY IMPORTS OF IRON.

The current statistics of iron and steel imports into the United States, when compared with those of a year ago tell the story of revived demand. Not that the higher prices on this side have been responded to in shipments of material ordinarily barred, but that the enlarged demand in all lines and an increasing purchasing ability have led to a natural expansion of business in lines in which there are regular importations. The figures we give below, from the Treasury Department statistics of imports for July, 1895 and 1894, and for the first seven months of each year, show a large increase in pig iron for July this year over the corresponding month of 1894. There is likewise a strong increase in bar iron and in ingots, blooms and billets. A shipment of 400 tons of cotton ties was made in July, this year, as against no shipments under that head all last year. Tin plates are a notable exception to the general rule, the July total this year being 2,700 tons less than in the preceding July, or 14 per cent. Yet the total to July 31st shows about 10 per cent increase over that for the first seven months of last year. The full table follows:

IMPORTS OF IRON AND STEEL FOR JULY AND FOR SEVEN MONTHS ENDING JULY 31, 1894 AND 1895—GROSS TONS.

	July.		Jan.—July.	
	1895.	1894.	1895.	1894.
Pig iron	4,222	999	10,959	9,144
Scrap iron and steel	428	207	1,174	1,234
Bar iron	2,121	615	8,016	2,811
Rails	.....	.....	2	486
Hoops and ties	.....	.....	50	.....
Hoop and band iron	1	81	1	713
Ingots, blooms, billets, etc	1,605	293	9,214	3,955
Sheets and plates	1,4 6	3,292	9,694	15,235
Cotton ties	399	.....	399	.....
Tin plates	16,252	18,927	136,289	122,568
Wire rods	2,005	1,671	13,313	12,591
Wire and wire rope	619	342	3,813	2,236
	29,068	26,427	192,924	170,973

Importations of iron ore are growing steadily, as compared with the period of depression. The July total was 28,464 tons; in July 1894, 12,736 tons. For the first seven months of this year the amount was 184,867 or two and a half times the total of 74,977 in the same period last year.

AUGUST has the distinction of making the largest month's inroad on stocks of coke iron since 1889—the net reduction being 95,000 tons. It has also made a record in bringing up the production of pig iron in the United States to a rate in excess of that reported for any single month in the history of the industry. The output of blast furnaces now active is at a yearly rate above 10,000,000 tons. Moreover, this promises to be augmented in the next four or five weeks. Four or five Virginia and Tennesese furnaces will be blown in this month or early in October, but there will be no increased production in the Alabama district, coke and ore supply being scarcely adequate for the furnaces in blast.

ORE shipments from Ashland last week were 77,734 tons; total for the season, 1,933,795 tons.

THE CLEVELAND DISTRICT.—Continued from page 3.

and moderate sales for 1895 delivery have been made at prices ranging from $16.75 to $17 valley furnace. There has been a good deal of market talk about Eastern iron and of purchases said to have been made at $16.80 Pittsburg, with a freight of from $2 to $2.15 to be deducted to get the furnace price. Yet the Eastern Bessemer market has been advancing of late, with a Philadelphia quotation of $15.50 to $16, or within $1 of the reported Pittsburg price of Eastern transactions. The status of the market is therefore difficult to arrive it. It is quite evident that a bear interest is at work; whether the moving purpose will be revealed in large purchases that will be recorded in the near future, or whether a powerful influence is being exerted for the general good to keep the market from the danger of an over-done boom, is not clearly developed. There are predictions, in the midst of it all, that an early buying movement will be seen that will carry the price of Bessemer to $17.50 at valley furnace. Foundry iron has been going along quietly, with orders taken every week, though no large contracts are included. The basis of $15 at valley furnace for No. 1 and $14 for No. 2 is generally maintained. Gray forge is held at $13.25 to $13.50 at valley furnace, with the scarcity of this grade still further emphasized. Lake Superior charcoal is firmer at $14@$14.50 Lake Erie port, but still lags behind coke iron.

Finished Material.

There have been no important contracts in the local market of late and the past week has brought the general run of small orders that marked its predecessor. In bars there is a moderate demand and sales are being made on the 1.40c basis, but the tonnage is not imposing. In plates, beams and channels and angles, there is practically the same condition. The evidences of waiting by buyers, noted heretofore, are still present; and on both sides of the market a close study of the indications for the immediate future. There is much counting on the railroads, and each week brings its share of orders from that source; but there is not yet the broad and deep and generous railroad demand that has been counted on to maintain the present scale of mill operations. Prices are quoted as before. Mills are catching up somewhat on plate orders and better deliveries are possible now. Sheet mills are in somewhat easier circumstances, though prices are stiff, on a basis of 2.75c for No. 27. For beams and channels 1.65c@1.75c Pittsburg, is still maintained; for tank steel 1.85c to 1.95c. Nothing has been done locally in steel billets, though one or two buyers are in the market for basic billets. Old material is firm, but quieter. Country scrap has come forward under the higher prices. Mill scrap has sold at $15.

LAKE SUPERIOR IRON MINES.

All signs fail in the case of the Marquette range strike. It has been predicted from time to time in the past nine weeks that the men were on the verge of calling it off, but the more desperate their condition the more emphatic their votes to continue the struggle. It was expected that on Monday of this week a vote would be taken allowing the men to return to work, but after parading to the various mine offices and going through the form of asking whether the company had anything new to offer, the men held a meeting and voted to prolong the strike. The companies' answer in several cases was that their proposition of compromise had been made eight weeks previous. The strange part of Monday's procedure was that the men who took the initiative had nothing to offer when given an opportunity to tell the object of their call. On Tuesday the Cambria mine's fires were drawn and the mine allowed to fill with water. Like action will be taken at the Lillie. Notice has been given by the Buffalo mines that no work will be done there for some months, everything being put in shape for a long shut-down. At the Section 21 property of the Lake Superior, the pumps were stopped last week and the mine is filling. The strikers at the Dexter mine asked permission to go to work on the company's offer, $1.75 a day for contract miners, but permission was refused. In a few cases union steam shovel men are at work at Ishpeming stockpiles. Ore from these is going forward at the rate of 9,000 to 10,000 tons a day, and all the stockpile ore will be shipped. The mining companies have now practically abandoned the idea of mining any further ore for 1895 shipment. The miners who are still on the ground are in need, but they are choosing to make their condition even worse; for there is no possibility of the strike being won.

President W. G. Mather, of the Cleveland-Cliffs Iron Co., has addressed a letter to the newspapers of Negaunee and Ishpeming, reviewing some of the incidents of the strike and answering some of the criticisms made on the attitude of the mining companies. It is temperate and conciliatory, and at the same time properly characterizes the course of the demagogues and fomenters of strife, who are largely responsible for the prolongation of the trouble after the mining companies, seven weeks ago offered to meet the wage demands of the men half way. We make one extract from the letter that gives some idea of the men's losses in wages, while it points out that had work continued uninterrupted they would have had an advance with the beginning of September: "It is true that the iron market is improving and if it continues, then in time the scale of wages or at least portions of it asked by the men will be in accordance with the times, and will then be cheerfully granted and paid by the companies. But what about all of this lost time and the hard feelings engendered therein? It is true that the companies desired not to raise wages until the contracts, taken at the low prices of this spring has been filled. They would have been filled about Sept. 1, and wages would have been then fairly raised. The men struck on July 14. What has been gained? Take this for example: the day laborer's pay was $1 per day. This man has lost nine weeks or 54 days, equalling $54. If he should go to work next Monday at $1.50 a day, it will take him 108 days (with the extra 50 cents he is striking for) or 18 weeks to make up what he has lost. In other words, it would take him until Feb. 1st, 1896, to get even,—and not until then will he get the full benefit of his $1.50 per day—if he gets it at all. If he had continued working and had not struck, or if he had accepted the compromise offered by the companies, he would have been getting his $1.25 per day since Aug. 1, and his $1.50 per day as soon as business justified it. The case is similar with all other classes of labor. The miners grumbled about the $1.70 basis. Don't they all know that when they were working on the $1.50 basis, the steady and skillful workers were making in many mines as high as two dollars per day and over? If the basis is advanced to $1.70 their earnings would, of course, be correspondingly increased. Why do you sensible men allow demagogues to deceive you about these plain facts, and stir you up against your employers?"

The banner cargo from Escanaba this season was 3,733 gross tons of Chapin ore taken by the Yale.

A Merritt road from Duluth to the Mesabi range is promised by the incorporation last week of the Duluth & Northwestern Railway Co. The incorporators are Leonidas, Alfred, Andrus R., John E. and L. F. Merritt. Alfred is the president, Andrus R. vice-president, Lon secretary and treasurer. The capital is $100,000. The proposed line is to run from deep water on St. Louis bay, Duluth, to the Mesabi range and beyond. It is said by the projectors that they have assurances from enough independent mines on the range to warrant going ahead.

The Mahoning Ore Co., in whose extensive properties at Hibbing various Mahoning valley furnace companies and one Pittsburg company are interested, has increased its capital stock from $150,000 to $200,000.

Approximate figures for the daily shipments from Mesabi and Vermilion mines are given as follows: Hale, 500 tons; Norman, 600; Biwabik, 250; Adams, 1,000; Canton, 2,500; Oliver, 5,000; Mountain Iron, 3,000; Ohio, 600; Sellers, 700; Lake Superior, 800; Mahoning, 2,500; Vega, 1,000; Franklin, 1,100; Minnesota and Chandler, 5,000; Pioneer, 1,000.

THE SOUTHERN BASIC PIG MOVEMENT.

An interesting article is contributed to the Baltimore *Manufacturers' Record*, under a Birmingham date, by H. S. Fleming, M. E., whose metallurgical experience and acquaintance with Southern development in iron and steel make him competent to speak on the significance of the operations of the chief iron producer of the South in the manufacture of pig iron for basic steel. Mr. Fleming believes some difficulty will be met in furnishing pig iron uniformly meeting the specifications of the Northern steel companies, that have recently made round purchases, if the attempt is made to use only the common red ores of the Birmingham district. The brown ores, with which success has been more positive, and uniformity in analysis assured, are scarcer and higher priced, and pig iron made from them might be debarred from the North because it could not meet the price of the Northern product. We quote from Mr. Fleming's article as follows:

For a number of years past efforts have been made to produce steel, or iron suitable for steel, in the South. It is unnecessary to go into the early trials and failures of the Roane Iron Co., in Chattanooga. In 1886 the South Tredegar works, in the same city, put in operation first one and then another small Clapp-Griffiths converter, producing a fair quality of steel. About the same time the Henderson Steel Co, afterward reorganized as the Jefferson Steel Works, in Birmingham, tried to produce steel in an open-hearth furnace, and made also a fair quality of material. Shortly afterward the Roane Iron Co. erected a Bessemer converter, with the intention of using Bessemer pig made at its Rockwood furnace from Cranberry ore. This latter did not succeed because of the high cost of the ore and its low grade, so some English Bessemer pig was imported and converted. Then the Southern Iron Co. took the plant and repaired the open-hearth furnaces. The works started, using the duplex process, that is, desiliconizing in the Bessemer converter and then disposing of the phosphorus and finishing the conversion in the open-hearth furnaces. Later a process for desiliconizing was brought forward in Birmingham, in which the iron from the cupola ran into a bath of molten slag containing a high percentage of iron oxides. This removed silicon, and the resultant metal was then ready for dephosphorization and final conversion in a basic open-hearth furnace. This same process, with slight modifications, was afterward tried at the Chattanooga plant of the Southern Iron Co. Besides these trials, all of which were on a commercial scale, the officers of the Tennessee Coal, Iron & Railway Co. made numerous trials in a small way of nearly every new steel-making process introduced, but nothing was attempted on a commercial scale.

This is, in condensed form, the history of steel-making in the South. At all of the places mentioned steel was made, some very good and some exceedingly bad. The difficulty in each case was that because of the uncontrollable irregularity of the output and the high cost they were commercial failures. Ever since the basic open-hearth process was first talked of in connection with Southern iron, trials have been made to see whether an iron meeting its requirements could not be produced. Various users of the process require different qualities of iron. At Pottstown, Pa., for instance, an iron was required exceedingly high in phosphorus, over two per cent if possible; under 0.5 per cent silicon, and under 0.02 per cent sulphur. The Southern Iron Co. endeavored to secure a similar iron for the Chattanooga works, making it at the Mannie and Aetna furnaces in Tennessee from an ore found at Mannie containing on an average about 55 per cent iron, six per cent silica and one per cent phosphorus. The difficulty was with the silicon in the pig. It was seldom under 1.5 per cent and usually over two per cent; therefore a desiliconizing process was necessary. Other works allow a greater margin. It is claimed that the Carnegie Co. in its contract specified the following:

Silicon, under	1 00 per cent.
Phosphorus, under	.75 " "
Sulphur, under	.05 " "

These specifications are not nearly so difficult to fill as the others given. The only question to be answered is, and that is a vital one: Can an iron of this composition be made from Birmingham ores?

Difficulty as to Scrap.

It might be stated here that one of the reasons advanced against the possibility of manufacturing steel in the South is that the amount of wrought scrap-iron available is exceedingly small. This is true, and has been found a serious difficulty in the operation of rolling mills. This scrap is necessary, because, when used with iron in steelmaking, it reduces the relative proportion of silicon and sulphur present in the charge. If an iron can be made in which these elements are sufficiently low, it is evident that the amount of scrap required will be reduced as the quality of the iron becomes better.

Some three years ago the Tennessee Company experimented with Cowan furnace, and, using brown hematites from Lawrence county, Tenn., and some other points, made a certain amount of iron within the specifications above given. Later, it repeated the experiment at Little Bell furnace, Bessemer, Ala., using Alabama and Georgia brown hematites, and at one time some red fossil hematites in the mixture. The results were fairly satisfactory, not perfectly so. Since both of the experiments above referred to were made there have been material improvements made in preparing coal for coking by more careful mining, washing and disintegrating. Similar improvements have been made in mining ore, and also changes at the furnaces and the better furnace practice that comes of experience.

Within the past few months the Tennessee Coal, Iron & R'y Co. has been again trying to produce a basic iron, this time at Alice furnace, in Birmingham, using only the hard and soft red fossil hematites. These trials have been full of difficulties. The red ores vary considerably in their iron and lime contents, requiring, therefore, the closest attention to the furnace. The soft red ore contains on an average 48 per cent iron, 14 per cent silica and five per cent alumina; the hard ore 39 per cent iron, eight per cent silica, 18 per cent lime and three per cent alumina. The washed coke contains from 12 to 14 per cent ash, of which five per cent is silica and 3.75 per cent alumina. For flux a mixture of limestone and dolomite is used.

The average cinder when making foundry iron is:

Silica	34 per cent
Alumina	15 " "
Lime	32 " "
Magnesia	18 " "

The average iron from this cinder will contain 1.5 per cent to 2.5 per cent silicon. The cinder produced at Alice when making low-silicon iron within the specifications runs about 32 per cent silica, and is therefore slightly more basic than the foundry cinder.

Basic Iron not Uniform.

The statement, made regarding the work at this furnace give the impression that iron within the specifications is being made at every cast. This is not the case, nor can the company reasonably expect that it will be. Sometimes two, three or four casts will be made, none of which can be classed as basic; then there will be one or several casts, all of which are within the limits of the specifications. Every cast is analyzed and this determines its quality.

I stated that the company cannot reasonably expect to secure this iron at every cast. My reason for saying this is that the specifications represent but little above the minimum contents of the two important elements, silicon and sulphur, which can be secured from the red hematite ores. While past experience is not always a criterion for future work, it has been shown time and again in this district by every furnace and company that has tried it that the red ores will not give a perfectly regular output, and particularly will this be so when the grade called for represents the extreme—the best that can be done. I do not understand why a mixture of brown ores is not used for this purpose. The price has, of course, much to do with it. Red ores are delivered for eighty-five cents per ton, and brown from $1.10 to $1.25. The latter are, however, higher in iron. At Little Bell furnace a mixture of washed and raw brown ore is being used with some red ores, and the average results are nearer the basic-iron specifications than at Alice. I think the greater part of the basic pig to be made in the South will come from these brown ores, as with them the minimum of silicon, etc., in the pig can be brought considerably below the figures required, thus allowing a fair margin for variation. With red ores there is none. The trials which have been made, as well as all past experience, show beyond all question that the speci-

fications as here given can easily be met by using brown ores, though, on the other hand, there is a small increase in the cost.

Brown Ores Preferable.

The reason why the Tennessee Coal, Iron & Railway Co. prefers red ores is quite plain. First, they are cheaper; and second—most important—the company's deposits of brown ore are neither so extensive nor of such quality as might be desired. If the company was to show that brown ores alone would make basic iron suitable for steel, it would put a premium on all brown ore in Georgia, Alabama and Tennessee, and quickly raise the price. There is plenty of this ore in the South. There are many millions of tons in each of the States named, and there would be but little increase in the cost of mining, but the Tennessee Co. does not own the mines.

I do not want to any way discourage this work. The Tennessee Co., whatever its motives, deserves great credit for the efforts which it has been making for several years both to improve the quality of Southern irons and to produce metal suitable for steel-making purposes. It has spent much money in this, and deserves a full measure of success. I think, however, that it would have been better to carry out the plan of the Little Bell experiments and obtain an entire success than this one at Alice, which is only partly a success.

CONDITION OF BLAST FURNACES OF U. S.*

Sept. 1, 1895.

Location of Furnaces.	Charcoal.					Bituminous or Coke.				
	Total No. of Stacks.	In Blast.		Out of Blast.		Total No. of Stacks.	In Blast.		Out of Blast.	
		Number.	Weekly capacity.	Number.	Weekly capacity.		Number.	Weekly capacity.	Number.	Weekly capacity.
New England	11	2	230	9	829	..	..	..	..	..
New York	6	1	94	5	637	5	2	2983	3	3335
Pennsylvania	13	2	95	11	865	5	3	2570	2	1440
Pittsburgh	.....	.....	.....	.....	.....	24	24	44452	.....	.....
Spiegel	.....	.....	.....	.....	.....	2	2	2064	.....	.....
Shenango Valley	.....	.....	.....	.....	.....	16	15	18103	1	600
Jun. and Con. Vals	.....	.....	.....	.....	.....	17	9	10512	8	3210
Maryland	4	.....	.....	4	310	5	.....	.....	5	5955
Virginia	4	.....	.....	4	210	23	12	7898	11	6027
North Carolina	.....	.....	.....	.....	.....	2	.....	.....	2	745
West Virginia	.....	.....	.....	.....	.....	4	2	2111	2	1714
Ohio—Mahoning Val	.....	.....	.....	.....	.....	12	9	11846	3	3970
East, Cent. & North	.....	.....	.....	.....	.....	17	14	15974	3	4005
Hocking Valley	.....	.....	.....	.....	.....	6	2	1086	4	1520
Hanging Rock	10	5	311	5	545	11	7	1862	4	1255
Kentucky	3	.....	.....	3	865	6	3	1200	3	1380
Tennessee	8	2	535	6	1810	13	6	5333	7	4260
Georgia	3	1	282	2	375	2	1	620	1	740
Alabama	12	2	369	10	2445	39	20	19671	19	11335
Indiana	.....	.....	.....	.....	.....	2	.....	.....	2	275
Illinois	.....	.....	.....	.....	.....	19	14	24007	5	5750
Michigan	20	4	1553	16	5132	.....	.....	.....	.....	.....
Wisconsin	4	2	1220	2	445	4	2	1904	2	1540
Minnesota	.....	.....	.....	.....	.....	1	.....	.....	1	665
Missouri	2	.....	.....	2	580	3	1	855	2	1425
Texas	4	.....	.....	4	985	.....	.....	.....	.....	.....
Oregon	1	.....	.....	1	280	.....	.....	.....	.....	.....
Colorado	.....	.....	.....	.....	.....	3	1	1006	2	1598
Total (char. and coke)	105	21	4689	84	16313	241	149	176057	92	62784
Total anthracite (New York, New Jersey, and Lehigh, Schuylkill, Upper and Lower Susquehanna and Lebanon valleys.)	127	49	31744	78	32241	.....	.....	.....	.....	.....

SUMMARY.

Fuel.	In Blast.						Out of Blast.			
	Number.			Weekly Capacity.			Number.		Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	21	22	28	4,689	4,428	6,298	84	84	16,313	16,169
Anthracite	49	41	43	31,744	23,257	20,006	78	88	32,241	36,350
Bituminous	149	140	55	176,057	148,820	57,177	92	101	62,784	70,386
Total	219	203	126	212,490	176,505	83,481	254	273	111,338	122,905

*The above table is condensed from the *American Manufacturer*. The tables of the *Iron Age* show in blast Sept. 1, 21 charcoal furnaces, with 4,376 tons weekly capacity, instead of 4,689; 194 coke and anthracite, with 189,653 tons weekly capacity, instead of 198 (adding together "bituminous" and anthracite in above), with 207,801 tons weekly capacity. Total 215 active furnaces, with a total capacity of 194,029 tons, instead of 212,490, as above.

MACHINE SHOP AND FOUNDRY.

American Machinery in Spain.—Writing to the *American Machinist* from Spain an American merchant says: "Having been many years established in this country and had great experience commercially with this nation permit us to point out to you one of the difficulties that we experience in introducing new classes of machinery, etc., and we have invariably found that printed information, such as is contained in illustrated catalogues, periodicals, etc., has not been sufficient to augment and increase business; what is actually required is that our manufacturers and farmers should actually see the goods, etc., and we would suggest that a number of American machine builders, etc., organize together for the purpose of having stock or show rooms in each of our provinces. Now, for instance, if several were disposed to entertain this proposal we could arrange a place for this purpose in a central part of this city for a minimum amount of rent, and we feel sure that by this means great impulse would be given to this class of business. Further, we would point out to you the laxity of advertising matter, such as pamphlets, etc., arriving from the United States, admitted we sometimes receive these publications, but in nothing like the extent to the number we receive from the United Kingdom. From our knowledge of Spain, a nicely got up catalogue or price list printed in the Spanish language, and a depot at each of the capitals of provinces, a grand future could be worked up for all classes of American machinery and tools."

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Action of Aluminum on Cast Iron.—A question much discussed among foundrymen is again given prominence by the advance publication of the chapter on aluminum which will appear in the 1894 volume of the "Mineral Resources of the United States." The following reference to the experiments of W. J. Keep and R. A. Hadfield on the effect of a small percentage of aluminum on cast iron is of interest:

In 1889 metallic aluminum came into use in treating molten iron and steel in the same way that ferro-magnesia had been employed previously, and a large part of the production of the Pittsburg Reduction Co. was consumed in this way. It had been found that cast iron and steel were benefited by the addition of a small quantity of aluminum, and numerous experiments were made to explain the action, and ascertain the exact character of the improvements in iron which were attributed to this treatment. The tests made by Mr. W. J. Keep showed that the increased solidity of the casting was due to the separating of the graphitic carbon which filled the space between the particles of iron. He explained this fact by supposing that at the time of solidifying, the chemically combined carbon assumed the graphitic form in consequence of the aluminum which was present, but the precise action of the aluminum was not understood.

Experiments were made in England to discover the cause of the changes produced in iron and steel by the small quantity of aluminum (1 per cent) added to the mold before casting. These experiments were described by Mr. R. A. Hadfield in a paper read before a meeting of the Iron and Steel Association, showing that the prevention of blow holes in castings and dispossession of graphitic carbon may be due to the reducing action of the aluminum, direct experiments having proved that the mold will decompose carbon oxide at a very high temperature, taking up its oxygen and setting its carbon free. This would prevent the escape of gas in molten iron or steel, and so prevent blow holes. Mr. Hadfield likened the action of aluminum to that of silicon at a high temperature.

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Expensiveness of Shop Operation at Night.—Running machine shops at night is attended by much more extra expense than is included in the general estimate of time and a half for labor and the cost of artificial lighting. In discussing the question, the *Practical Engineer* says: The working of night shifts is often resorted to in some shops when there is a great pressure of work. The wisdom of working such shifts is often questioned. They are seldom adopted without consideration, nor until other means appear to be inadequate; but the work done under such condititions is usually costly, wasteful, unsatisfactory and the results not commensurate with the expenditure involved. A night gang is hastily col-

lected, a night foreman engaged, and the idea is that the output will be doubled, at little more than a corresponding increase in cost. The night gang is run for several weeks, or perhaps months. At the end of that time accounts do not show what was anticipated. There has been leakage somewhere, and it has come about in this wise: work by gaslight is never so profitable as work done in the day-time. No artificial light is so good as diffused daylight. Men can't see so well to move about, nor to work to fine lines, nor to operate machines, nor to read drawings. Added to this is the fact that there are more blunders made and more bad work done in the night than in the day, and it is easy to see why night work does not pay.

MAHER WATER TUBE BOILER.

An improvement in water tube boilers has been perfected by John Maher, of Bay City, Mich. It consists of an arrangement and construction of the parts with the object of providing a smoke box that can be attached to a combined water tube and fire tube boiler that will increase the heating surface and give more efficient water circulation. In the cuts given below, Fig. 1 is a longitudinal central section of the boiler, and Fig. 2 represents a rear perspective view. In these cuts, A is the cylindrical shell of the fire-tube portion of the boiler

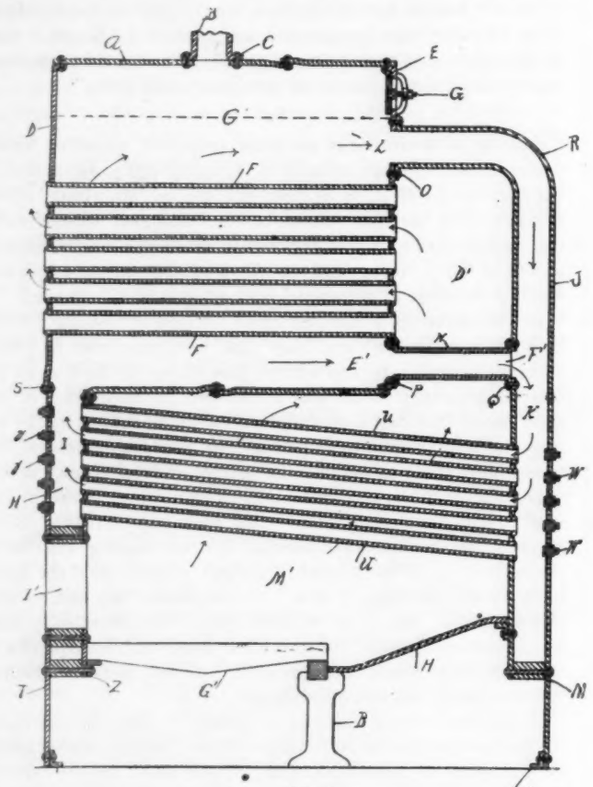


FIG. 1.

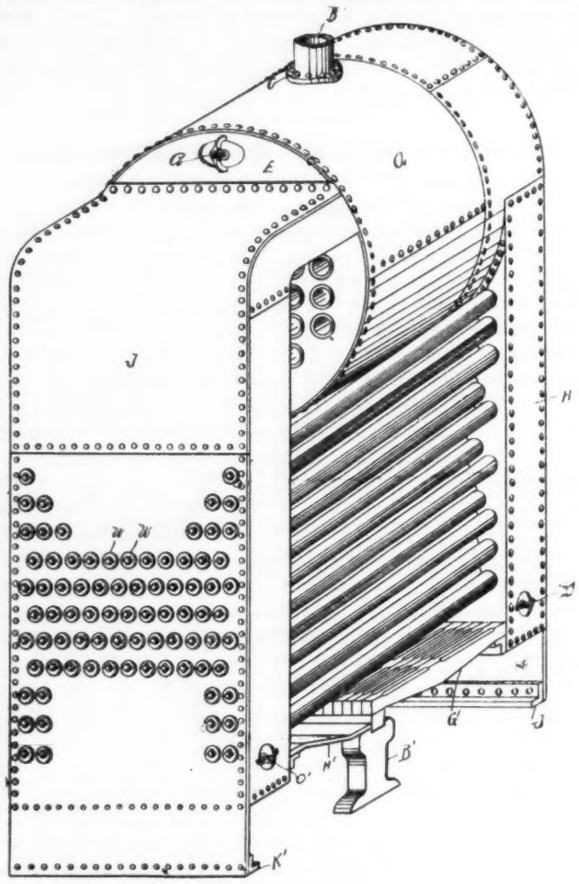


FIG. 2.

MAHER WATER TUBE BOILER.

and B is the steam dome. D is the front head of the shell and E the rear head; F the fire tubes connecting them. H is the front water leg, made rectangular in form and the full width of the shell, and I is its water space within. J represents the rear water leg, and D′ is the smoke-box formed by it. K is the water-space within. The rear leg J is also made rectangular in form and the full width of the shell. L represents an opening formed in the rear head E above the fire-tubes and below the water-line for the purpose of connecting the rear water-leg J by means of rivets and a right-angle bend at R, projecting horizontally far enough to provide suitable space for the smoke-box D′, thence projecting down to M, where the outer sheet of the leg J is, and riveted to an angle iron J′ which forms the support for the water-leg. Thus a large opening is secured in the shell A at L for the purpose of increasing water circulation, and at the same time the right angle bend formed in the upper end of the water-leg J from R to L greatly increases the heating surface.

N represents a pipe secured to an opening formed in the lower portion of the boiler shell A at E′, and secured thereto by means of rivets. The opposite end of the pipe N is secured to the rear water-leg J, and has exit therein by means of an opening formed at F′ in the water-leg J and secured by means of rivets. There is provided additional water circulation and means for the sediment to have exit to the rear water-leg J, where it is removed by means of a hand-hole; and at the same time the pipe N provides the lower support for the circular shell A. The front water-leg H is secured to the shell A by means of rivets and projects downward to T, where its outer sheet projects below the water-leg H, and is riveted to an angle-iron K′, which forms the support for the water-leg. The latter also has a hand-hole provided in its lower portion at L′ for the purpose of removing sediment.

Higher Iron Rates in Central Territory.

The Central Traffic Association meeting in Chicago, Sept. 12, decided to abrogate the special iron tariff and the official classification basis will be restored Oct. 15. It was also agreed that pig iron rates should be advanced to the basis of $4.20 per ton and billets to the basis of $4.75 per ton from Chicago to New York. The rates on pig iron to all the points in Central Traffic Association territory were advanced to the basis of the following rates to Chicago: Buffalo, Pittsburg and Wheeling, $2.50; on billets, blooms, etc., Buffalo, Pittsburg and Wheeling, $2.85. From Cleveland to Chicago the rate on pig iron was increased from $1.80 to $1.90; billets $2.15 to $2.25; manufactured iron 12 cents to 14 cents; from Cleveland to East St. Louis, pig iron, $2.35 to $2.50; billets, $2.75 to $2.90, and manufactured iron, 15 cents to 18 cents.

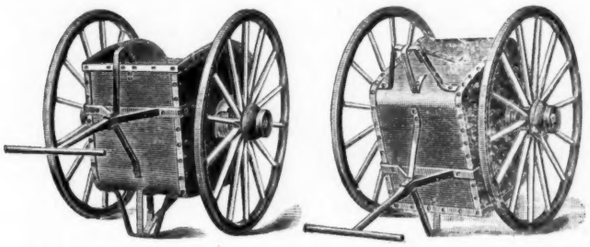
CHAIRMAN H. H. Porter, President Greatsinger, Vice President Sellwood, and other officers of the Duluth & Iron Range Road have been on a tour of inspection over the Mesabi range with a view to extensions of tracks.

CAPT. Jas. Cundy, who was on the Mesabi range in its first two years, is now in charge of mining operations of the Illinois Steel Co., in Dodge Co., Wis. The ore is taken from a hillside and is of low grade. The deposit covers 1,800 acres. About 80 men are now employed.

STEEL ORE-CHARGING CART.

While the bulk of the barrow business of the Lansing Wheelbarrow Co., of Lansing, Mich., is in wooden wheelbarrows, of which something like 100,000 a year are turned out, the company makes a specialty of its steel charging cart, illustrations of which are given in this connection. One of the cuts shows the position of the cart after dumping.

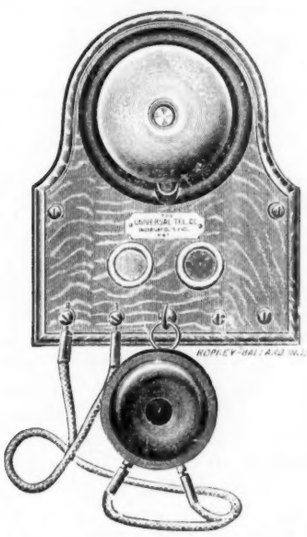
The wheels used are wagon wheels, 48 inches in diameter, this large diameter making it easy to carry a heavy load. The barrow is fastened securely to the axle on which it swings. It is so evenly balanced that to dump the barrow it is only necessary to exert a little pressure on the handles. The body



of the cart is made of No. 8 steel plate, banded around the top with ¼x1½ in. iron. To stiffen the sides and support the axle, a ¼-in. steel sheet, 12x24 in., and a ⅜-in. steel sheet, 6 in. square are securely riveted to the inside of the body. The axle passes through the center of each sheet and through the cart and is riveted to the body by iron hangers. A steel shield riveted to the body over the axles prevents dirt from getting into the wheel boxes and cutting them. The body of the cart is 24 in. wide, 33 in. high and 40 in. long. Its weight complete is 540 lbs. These carts have been supplied of late to many of the newest and best equipped plants in the country.

A TELEPHONE TO CONNECT OFFICE AND MILL.

The Universal Telephone Co., Indianapolis, Ind., is making an inexpensive telephone to meet the demand for a cheap but serviceable instrument for residences, between house and barn, and for rural districts between stores and homes, mills



and offices, etc. The instruments are mounted on stained mahogany back-boards, with nickel plated fittings and are attractive in appearance. The makers claim that it is impossible for them to get out of adjustment and that they are always ready for service. An outfit consists of two complete telephones, a 230 foot coil of insulated wire and batteries.

THE Calumet Furnace, at Chicago, blew in on Sept. 15. The product will be known as Calumet and will be graded strictly by analysis, consisting of strong foundry, Scotch or soft, coke Bessemer and malleable Bessemer. Rogers, Brown & Co. have been selected as sales agents and will have the handling of the entire product.

PUBLICATIONS RECEIVED.

"Cranes" is the title of a neat and plentifully illustrated catalogue issued by the Whiting Foundry Equipment Co., of Chicago. Beginning with electric traveling cranes, the descriptions run the gamut of the crane class, through electric jib cranes, steam jib cranes, miscellaneous power cranes, car wheel foundry cranes, belt power jib cranes, column jib cranes, hand power jib cranes, floor pendant, side platform, chain hoist, and compressed air travelers—in short, all the modifications of modern equipment for the expeditious and economical handling of material in the foundry.

"Coal Handling for Steam Generation" is treated by the C. W. Hunt Co., New York, in a well illustrated pamphlet in which the arrangements adopted in several power stations are described and pictured. As an illustration of the economies of modern methods in this particular, the company cites the following: "Taking coal from the hold of a vessel which comes at irregular times, storing it in a 6,000 ton pocket 800 feet distant, taking it from the pocket and delivering it continuously, day and night to the front of the boilers, for a total cost, including the interest on the investment, of less than 3½ cents per ton, from the hold of the vessel to the boiler furnaces, manifestly requires a large expenditure for machinery. But the reduction of the cost of handling 25,000 tons of coal per annum from 27½ cents to 3½ cents per ton pays a net profit, above interest and all expenses, and available for dividends of $6,000 per annum."

The heavy machine tools built by Hilles & Jones Co., of Wilmington, Del., for ship-yards, boiler shops, bridge works, car and locomotive works and for special work on plate and shape iron, are shown in a series of striking half tone plates embodied in the company's last catalogue. Chief among the massive machines shown are single punches and shears of various depths of throat, multiple punches, plate shears, bar and billet shears, gate shears, beam coping machines, plate bending rolls, plate straightening rolls, drilling machinery and vertical milling machines.

James L. Watkins, special agent, has prepared general bulletin No. 9 of the statistical division of the U. S. Department of Agriculture, on "Production and Price of Cotton for One Hundred Years." While cotton is not the largest crop raised in the United States, it commands more attention abroad than any other because more extensively used by foreign countries than any other and because we contribute to the world more than 60 per cent of the raw material consumed.

A. D. Quint, Hartford, Conn., illustrates in a new catalogue the improvements made in his turret drilling machines since the first friction drill was brought out in 1892. The copy of the World's Fair award on No. 1 turret drills exhibited at Chicago, printed in the catalogue, brings out its salient features: "The power as applied to the spindle is graduated to the size of the tool in use, thus affecting a saving in loss of small tool breakage. Only the tool in use revolves; all others remain stationary. The machine drills and taps without moving the work or stopping the tools, the work remaining in place during the operation, thus securing accurate work with ease. The machine is under perfect control and may be started, stopped or reversed instantly. It is the only turret machine built that revolves its cutting tool—all others revolve or move the work."

H. M. Greene & Co., Chicago, have issued a handy booklet, printed in green and red, containing the "History of Grain and the Grain Trade of the World." A picture 6,000 years old is reproduced showing the elevating of Egyptian wheat into granaries. The history of the world's wheat markets is traced down to to-day, and the great modern store cities and distributing points are described, and an idea given of the magnitude of their trade. The book is sent free on application.

Wm. C. Day has prepared the report on "The Stone Industry in 1894" for the coming volume of the Mineral Resources of the United States. It has just been sent out as a separate pamphlet. The statistics show that the value of the limestone produced in 1894 in the various States, for use as blast-furnace flux was as follows. Pennsylvania, $333,625; Colorado, $72,680; Ohio, $50,000; Virginia, $23,460; Montana, $13,955 Alabama, $8,000; New Jersey, $8,136; New York, $8,386; Utah, $2,000.

SOME DIFFICULTIES IN MANUFACTURING*.

BY CLARENCE E. BEMENT, LANSING, MICH.

This paper might be more appropriately named "One Manufacturer's Difficulties in Manufacturing," as the writer's 16 years connection with the manufacturing business has been in one capacity, in one institution, and in one limited line of manufacturing, and he has no call to speak for any but his own institution, only as he supposes that his experience has been the general experience of others.

These are days in which complete manufacturing plants are erected, supplied with every device which money (which means mechanical skill) can supply to facilitate and cheapen work. Our plant, much to our regret, did not spring goddess-like into perfect being at one stroke, but has been the result of 25 years of accretions, and thereby hangs this tale, for from this source have arisen many of our difficulties.

Arrangements for Carrying Power.

One of the most serious problems is that involved in the transmission of power. When our work was performed by a portable saw-mill boiler and engine, and about 50 feet of 1 15-16 shafting, it presented few difficulties, but with 250 horse power to transmit, and 2,000 feet of line shafting, varying from 3 15-16 to 1 15-16, and with no two of our buildings on the same level, the problem becomes more complicated. We have adopted a few general principles with regard to shafting and pulleys. All shafting is one of three sizes—1 15 16, 2 7 16 and 2 15-16—and every piece bought within the last six years is 12 feet long. All couplings are drilled to one templet for corresponding sizes of shafting, so that we have little trouble in replacing a broken piece. All plain pulleys bought within the last five years are those made by the Medart Wrought Iron Pulley Co., and all of them over 12 inches in diameter are split. Those bought with 1 15-16 hole have hubs large enough to stand boring to 2 7-16. Those bought with 2 7-16 hole have hubs large enough to stand boring to 2 15 16. This is done to enable us to increase the size of shafting as the number of machines attached to it demands, and use the same pulleys. The grade of the street on which our works are located has been raised two or three feet since the first buildings were erected, so that in building a new wood shop some four years ago we were obliged to raise it some three feet above the level of one of the old main buildings in which our power and main line shaft were located. The line shaft could not be continued, and the line shaft in the new building was only three feet above the old one, not giving sufficient length of belt to drive one from the other. By a very simple arrangement of idler pulleys and frame, devised by Mr. S. E. Jarvis, the power necessary to run all our wood working machines is transmitted by a 14-inch belt, giving as great efficiency as though the shafts were 20 feet apart.

Power is furnished to our blacksmith and forge department, which is at right angles to the other buildings, by an independent engine, and steam from the main boiler house. There are reasons why this method, though it may not represent the highest theoretical economy, is the most economical for our purposes. In the first place, the work done by this department is used by the wood and machine shops, and consequently it is more frequently behind in its work and oftener needs to run over time. With the present arrangement this can be done without running the main engine and a long line of intervening shafting. So, too, if anything happens to the main engine the forge department is not obliged to shut down.

The economy of a similar arrangement in the foundry is not so apparent, but it has enabled us to take off several heats in the last five or six years when the main engine was disabled. It also enables us to vary the speed of the fan during the heat, either to increase or slacken, or increase or diminish the speed with which the iron is being melted.

The question of counter-shafts in a manufacturing institution is always a vexed one, and I am not very confident that our experiment is a solution. In equipping a new stove shop three years ago we tried the experiment of substituting for about 30 counter-shafts an equal number of clutch pulleys. We certainly have not spent as much money for repairs by this arrangement, and have saved considerable machinery and belting. That the experiment was not a distinct success arose more from the fact that we made a mistake in the selection of the clutch pulley than from any failure of the scheme itself. This experience has not deterred us, however, from the use of clutch pulleys in making connections from the main line shaft to shorter pieces of shafting in the same or other departments, thereby enabling us to shut down one line or department without stopping the whole shop.

Difficulties in Making Additions.

As before stated, the enlargement of a plant beyond the capacity originally designed, always presents many unforeseen difficulties, especially in the matter of light and convenience in handling material. Our forge department, built some 12 years ago, was at first 50x100 feet, and was considered ample to do our business for at least 25 years. But we added first 75 feet to its length, then 30x175 feet on one side, then 70x80 feet to its length again, giving us a building 250x80, with two or three inside walls pierced by arched openings, and with a roof made up of half a dozen pitches and gables. The light was bad, the ventilation worse, and it was as expensive a shop to handle material in as you can imagine. In remodeling this building a year ago, after a fire which destroyed the roof, we were enabled to get it into very good shape by raising the side walls to 17 feet, carrying the roof on two rows of heavy posts, and making it practically fire proof by using No. 20 corrugated steel, resting on heavy timber purlins five feet apart, thus getting rid of all wood except enough to support the middle and ends of the 10 foot sheets of corrugated steel. We also substituted for the ventilator which we have been in the habit of using on this class of buildings, flat windows at the peak, end to end, and opening by sliding in grooves down the roof. We thus avoid the danger of fire arising from the ordinary ventilator, which had been the cause of our two most serious conflagrations. In this building, too, we attached our shafting to posts instead of hanging it to the roof or ceiling as heretofore, thus obtaining greater solidity and avoiding the eternal getting-out-of-line that goes with shafting hung from roof or ceiling.

In the foundry about the same condition exists as in the forge department. It runs straggling along the river's bank for 450 feet, and is made up of three additions and the main building, all at different angles to each other. As our cupola is not in the center of this 450 feet, we have been in the habit of furnishing the extreme end with iron by means of big bull ladles, carried by two, three or four men; this required about 10 men for a portion of every heat, in addition to the molders who used the iron. At the time of putting on the last addition we decided that it would be necessary to provide some more economical method of transporting this iron as well as for handling the casting from the "mash" to the cleaning room. Mr. S. E. Jarvis, of this city, designed an overhead track that has enabled us to dispense with six of the ten men for handling the iron, and cut down our force of cupola men, tenders, casting cleaners, etc., from an average of 30 to an average of 25, while the amount of iron we melt per diem has increased from an average of 15 tons to an average of 20 tons per diem. Mr. Jarvis' track consists of a plain 6-inch "I" beam, weighing 15 pounds, laid flatwise and suspended by hangers attached to the web. The traveler consists of two pulleys attached to the two angles of an equilateral triangle, the pulleys running on the edge of the flange of the "I" beam, and the load suspended from the third angle of the triangle. As the cleaning room is in another building, and across a railroad track, and the cupola at one side of the center line of the molding room, it was necessary to provide a system of switches and a broken section of track, all of which was easily accomplished through Mr. Jarvis' well known ingenuity.

The worst feature in adding to an old plant is the necessity of cutting off the light on some side. The average manufacturing building is built without light enough, especially if it is more than one story high, and when you begin by putting an addition, first on one side and then another, you eventually get a shop without any light, and this has been our experience. The only remedy, now, is plenty of artificial light, and

*Read at the last meeting of the Michigan Engineering Society, held at Lansing, Mich.

this we have tried to supply by means of electricity, but even that is a poor substitute for daylight.

Machinery Repairs

Another harassing question is that of keeping up repairs on machinery and tools, and in spite of every effort this item crawls up on you. You may start in with a modest repair shop outfit of a second-hand lathe and planer and two men to run them, but it does not take long for that force to crawl up to five or six or even eight men, and the inventory of your repair shop to represent three or four thousand dollars, instead of the five hundred you started with. We do not realize what a difference exists between working a machine up to its capacity and only doing a moderate amount of work on it until you have consulted the repair shop's account with that machine in the dull season and the busy season. You ordinarily run 10 hours out of the 24, but in the busy season, from December 1 to March 1, you may run 22 hours out of the 24, and then apparently the work of the repair department does not double, but it trebles, and you have a broken machine on your hands for a steady diet. This of course may arise from the fact that night forces are generally picked up, not from the best class of workmen, but from those who are out of work. In order to avoid complications in repairs we have adopted the plan, when possible, of buying all of one class of machines of one make and also one size when that is feasible. This simplifies carrying repairs in stock. So, too, it saves expense in patterns, as we always intend when a machine breaks down to make the repairs ourselves, and consequently the making of one pattern, if it is a cast piece, may repair several machines. Small machines, like emery grinders and buffers, are made in our repair shop to standard sizes, and as the shaft is what wears out in these machines, we only have to have one in stock to repair any machine of that size. When a piece has proven weak it is then put into stock and one or more extras always carried.

A manufacturing plant making one article, or a limited variety of one class of articles, has little knowledge of the additional labor involved in the manufacture of a large and varied class of goods. In these days manufacturing is not one business to be learned, but every one of its different branches is a business of itself. You may know a good deal about forming flat steel plates into shape under a drop hammer and be absolutely ignorant of the methods of making drop forgings, or even of forming your own steel plates in deep shapes under a drawing press. So that it happens that building a new tool or article, may involve, and quite often does, learning a new trade.

Every new tool also involves the addition to the plant of just so many square feet of floor space, and this in every department aside from the warehouse where surplus stock, or stock for future shipment is kept. Suppose the new tool has 25 or 100 different pieces, and the latter is the safer figure, and you are going to make a thousand of the articles. Every one of these pieces must have room as it passes through the department in which it originates, to the department in which the tool is assembled. As it is physically impossible, ordinarily, to get all parts of a tool together at just the same time, there must be in the assembling room, racks, or bins, or barrels, or other means of storing these parts while the rest are coming through, and here comes one of the greatest difficulties in manufacturing a great variety of tools, viz., that no tool can be mounted or assembled as long as there is missing one bolt, or nut, or washer, or cotter, or the slightest and most insignificant piece that goes to the making of that tool. The 1 in. x 9-64 spring cotter is just as essential as the 25 pound piece of casting or the 50 pound steel frame or the four foot wheel.

Management of Men.

No problem worries the average superintendent more than the management of the men. As a plant increases in size, and more men are employed, one loses his personal grip on the employes, and is more frequently tempted to deal with them as a body, and not take personal peculiarities and conditions into account. This on the part of the employer leads to lack of sympathy, and the laying down of arbitrary rules that do not always work to the advantage of the men, and on the part of the men to a spirit of not "caring a damn," that is most injurious to the employer. A spirit of accommodation must be cultivated, and no superintendent should ever decide a question with relation to his men while angry. In my judgment more labor troubles arise from both sides going off at half-cock than from any other cause. Small personal accommodations to men I have found of the greatest value in tying them to one's interest, and making them feel that your good and prosperity was theirs. But in this connection the foreman becomes of great importance, as well in that as in the direct manufacturing. A superintendent's grief in connection with the handling of men generally comes from those departments whose foremen lack judgment and good co mmon sense. The foremen are the most important elements in good and economical manufacturing. It is very easy to define a good foreman, but not so easy to find him. He must, to crown all, be systematic; then be able to get along with men and know when they are doing a day's work and how to make them do it. He must have firmness, determination and nerve, and ought to be a first-class mechanic in his line.

In these days of piece work there has arisen a new difficulty in manufacturing. It is called nursing a job, and consists in doing only as much of a day's work as will make fair wages and not lead to a cut. The man arguing that if he makes $2.50 per diem on his machine, his piece price will not be disturbed, while if he makes $3 50 per diem, which he can easily do, it will simply result in his wages being cut to a basis of $2.50 and making him work so much harder. This system of nursing jobs exists in every shop where piece work is being done, and especially where a number of machines are doing the same class of work, and you are largely dependent upon the sagacity of the foreman to discover and remedy the trouble. It sometimes necessitates the changing of the entire force. Another draw back to piece work is the education of the men to th nk that it is worth more to do the same thing by the piece than by the day. For example, a man might turn out a hundred pieces of a certain kind for a day's work, for which he would be satisfied if he received $1.50 per day, but if you wanted him to work by the piece he would expect to receive $2 for the same amount of labor. In other words, the men look upon piece work as a sort of fetich which the employer is willing to pay something for worshipping.

I have consumed enough of your time in relating what are simply my personal experiences, but in closing wish to speak of one of the greatest drawbacks in the manufacturing business in at least one institution that I know of, viz.: the lack of technical education on the part of the employers, or the superintendent, at least. I am a hearty believer in *practical* knowledge, and see its necessity more every day. But if to one's practical experience can be added the best technical education, who can dispute the excellence that would result. The only trouble is that technical education gives some men an exaggerated condition of big-head so that they do not properly profit by their practical experience. If there could be some arrangement made by which men could first get their practical experience and then add to it the technical education, it would, it seems to me, be an ideal state of affairs.

The Largest Foundry Iron Maker.

In No. 6 of the vest-pocket "Nugget" folder sent out by Rogers, Brown & Co., the following facts are given about a year's shipments by the leading Southern producer of pig iron:

The principal shipments of iron by the Tennessee Coal, Iron & Railroad Co., for the year ended June 30, 1895, by States were:

Ohio	136,487	Tennessee	30,368
Alabama	89,054	Missouri	29,851
Kentucky	48,376	Michigan	28,170
New York	44,690	Indiana	28,047
Illinois	38 736	Pennsylvania	27,215
New Jersey	31,965		

The product also went into 28 other States and Territories, mostly distributed by Rogers, Brown & Co., the company's general agents. The total shipments were 572,910 gross tons. Shipments to all foreign countries were about 3,000 tons.

A SHARON, Pa., dispatch says that President F. H. Buhl of the Sharon Iron Works, has secured control of a rolling mill at Danville, Pa., and that Irwin Hyde, of Sharon, will be manager of the plant.

REVIVAL OF LAKE-SHIP BUILDING.

The following table will assist ship-builders and vessel owners to realize that the capacity of new vessels to be built in 1896 will eclipse the records of 1891, when vessels aggregating over 111,000 tons carrying capacity were put forth from lake ship yards. Greater dimensions in modern lake carriers is the cause of the great increase in capacity. History is again repeating itself in the lake trade and one of the 400-foot ships of to-day will carry as much as three of the steamers that were in the lead less than ten years ago. The fall period when orders for new ships are placed has hardly been reached, but the situation has been anticipated and thirteen steel vessels are already under contract. The list does not include any of the vessels contracted for some time ago, and which have been so far completed that they will engage in service of any kind during the closing months of the present season. Ten of the new vessels are steel steamers of the largest and best class and three are steel tow barges. One of the steam vessels is a revenue cutter for the government and another is a side wheel passenger boat. Exclusive of these two ships, which will take no part in carrying freight, the other new vessels will have a combined carrying capacity of 49,500 net tons on 16 feet draft. The valuation of all thirteen vessels is about $2,807,800. On Dec. 1 of last year—three months later than the present date, when orders were well covered—the capacity of freight vessels under contract was but 30,250 tons, and their valuation, exclusive of the passenger steamer North Land and the Cleveland & Buffalo Transit Co.'s steamer, which was then in contemplation, was only $1,870,000. The list of ships now under contract follows:

NEW VESSELS UNDER CONTRACT IN LAKE SHIP YARDS SEPT. 1, 1895—FOR SERVICE IN 1896.

	Capacity estimated, net tons, on 16 feet draft.	Value estimated
F. W. Wheeler & Co., West Bay City, Mich.—		
One 400-foot steel steamer for Eddy Bros. & Shaw, Bay City, Mich.	5,000	$265,000
One 400-foot steel steamer for Roby and others, Detroit, Mich.	5 000	265,000
One 378-foot steel steamer for D. C. Whitney, Detroit, Mich.	4,500	240,000
One 386-foot steel steamer for John Mitchell and others, Cleveland, O.	4,750	245,000
Chicago Ship Building Co., South Chicago, Ill.—		
One 375-foot steel steamer for C. W. Elphicke and others, Chicago.	4,500	240,000
Two steel tow barges for Minnesota Steamship Co., Cleveland.	7,000	180,000
One steel tow barge for Northwestern Transportation Co., Cleveland, O.	3,500	90,000
Cleveland Ship Building Co., Cleveland, O.—		
One 395-foot steel steamer for Wilson Transit Co., Cleveland.	4,750	250,000
One 400-foot steel steamer for A. B. Wolvin, Duluth, Minn.	5,000	260,000
Globe Iron Works Co., Cleveland, O —		
One 415-foot steel steamer for the builders.	5,500	275 000
One U. S. revenue cutter for Treasury Department.	.....	147,800
Detroit Dry Dock Co., Detroit, Mich.—		
One side wheel passenger steamer for C. & B. Transit Co., Cleveland.	.....	350,000
	49,500	$2,807,800

Note.—Valuations are approximate and may appear a little high, but advancing tendency of prices warrants figures somewhat above actual contract prices.

It is evident from the foregoing figures and from the present outlook regarding next season's business, which warrants the payment of $1 or better per ton on ore contracts, that another period of prosperity in the lake business is at hand, and that the ship building industry has little to fear from the 20 foot channel and like improvements. While it is true that in the modern 400 foot freighter the capacity of lake vessels is increased 1,000 tons to 1,500 tons each, this will be more than offset by the fact that a large number of the wooden steamers will in the meantime be turned into trades that are not considered competitive in the general cargo business. The fact also remains that the passenger steamer business of the lakes is in its infancy. * * *

Although the price of material entering into the construction of steel ships has been almost doubled of late, the addition to prices of new ships from this source is not of sufficient importance to be taken largely into account in the matter of placing orders with ship builders. It is not, as some might suppose, a particular drawback to active operations in the ship yards. Labor is a far more important item in ship building. Immediate advantages in carrying charges offset the higher cost of material many times over, but with the ship owner who is in business through good and bad years the policy of building at this time, when all costs are much higher than in times of depression, is another matter.—[Marine Review.

THE NEW SHAFTING LIST.

In accordance with the agreement recently made by makers of cold rolled or cold drawn shafting, Fitzsimons & Co., of Cleveland, have sent out the following list:

ROUNDS FOR SHAFTING, PISTON RODS, ETC.

Diam.	Weight per foot.	Price per pound.	Diam.	Weight per foot.	Price per lb.	Diam.	Weight per foot.	Price per lb.
3-16 "	.095		1 "	2.68		2½ "	16.70	
7-32	.130	13	1 1-16	3.02		2 9-16	17.55	
¼	.167		1 5-64	3.11		2⅝	18.41	
			1 3-32	3.20		2 11-16	19.31	
5-16	.260	11	1⅛	3.38		2¾	20.21	5
11-32	.320		1 3-16	3.77	5½	2 13-16	21.15	
			1 2-10	3.86		2⅞	22.09	
⅜	.375		1¼	4.17		2 15-16	23.06	
13-32	.450		1 5-16	4.61		3	24.05	
7-16	.511	9	1⅜	5.05				
15-32	.586		1 13-32	5.26		3⅛	26.09	
½	.667					3 3-16	27.16	
			1 7-16	5.52		3¼	28.22	5½
9-16	.845		1 15-32	5.60		3⅜	30.43	
19-32	1.00		1½	6.01		3 7-16	31.58	
⅝	1.05	7¼	1 9-16	6.52		3½	32.73	
21-32	1.17		1⅝	7.06				
11-16	1.26		1 11-16	7.61		3⅝	35.20	
23-32	1.38		1¾	8.18		3 11-16	36.40	
			1 13-16	8.78		3¾	37.57	
¾	1.50		1⅞	9.39		3⅞	39.40	6
13-16	1.77		1 15-16	10.03	5	3 15-16	41.04	
53-64	1.90		2	10.69		4	42.75	
27-32	1.94	6½	2 1-16	11.35				
⅞	2.05		2⅛	12.07				
29-32	2.20		2 3-16	12.80				
15-16	2.35		2¼	13.52				
31-32	2.52		2 5-16	14.35				
			2⅜	15.07				
			2 7-16	15.89				

SQUARES FOR KEYES, SPLINES, SQUARE SHAFTS, ETC.

Square.	Weight per foot.	Price per lb.	Square.	Weight per foot.	Price per lb.
¼ "	.213		1 "	3.40	
9-32	.270	16	1 1-16	3.85	
5-16	.332		1⅛	4.30	
			1¼	5.31	
⅜	.479		1⅜	6.43	
7-16	.652	14	1½	7.66	
			1⅝	8.98	8½
½	.850		1¾	10.41	
9 16	1.08	12	2	13.60	
⅝	1.34		2¼	17.25	
11-16	1.61		2½	21.26	
			2¾	25.72	
¾	1.92		3	30.61	
13-16	2.25				
⅞	2.60	10			
15-16	2.99				

EXTRAS FOR ROUNDS, SQUARES AND FLATS.

Lengths 1 foot to 24 feet, inclusive, no extra charge.
6" to 11¾" long, ½c. per pound net extra.
3" to 5¾" long, 1c. per pound net extra.
Over 24' and under 30' long, ½c. per pound net extra.
Over 30' and under 35' long, 1c. per pound net extra.
Lengths 35 feet or over, or under 3 inches, subject to special price.
Pump and piston rods, ½c. p r pound net extra.
Boxing at cost.

Air Hoists in Blacksmith Shops.

At the West Philadelphia shops of the Pennsylvania Railroad air hoists are used in the blacksmith shop, where the heavy forms for the steam hammers are kept on a floor outside of the building. An overhead track runs from the two hammers where a variety of forms are used out through the door where there is a switch, and turning passes over the place where the forms are kept. On this track there is an air hoist which can be made to pick up the form and carry it to the hammer and put it in place without the men doing the work being compelled to do any lifting at all. The objection to the use of air where the hoist is to be moved for any distance that an inconvenient length of hose must be used is overcome in this instance by having an air connection at each of the hammers and a length of stationary hose at each of the storage places sufficient to reach the hoist wherever it may be standing, and then equipping the latter with an air brake coupling, which permits the connection to be made and the load lifted. Then the connection is broken and the load carried to the point where it is to be lowered, and a new connection made to do the proper adjusting. This certainly solves the problem where the load is always handled at given points within the range of lengths of hose of modern lengths.

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick.

GOVERNMENT ⁜ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

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HIGH GRADE FIRE BRICK for

Rolling Mills, Steel Works, Blast Furnaces, Cupola Linings, Boiler Settings.

—All Shapes in Stock.—

Our large capacity, 8,000,000 annually, and modern plant, enable us to handle contracts of any size promptly.

Ground or Calcined Clay in Sacks or Bulk.

Stowe, Fuller & Co.

WESTERN AGENTS OF

Mount Savage and Queen's Run Fire Brick,

The leading BRICK of this country.

MANUFACTURERS OF

OHIO FIRE BRICK. ALL SHAPES IN STOCK.

The largest shippers of FIRE BRICK in the West.

Warehouse and Docks: 193-195 Merwin Street,

CLEVELAND, OHIO.

INDUSTRIAL SUMMARY.

New Construction:—

The National Mfg. Co., Huntsville, Ala., will erect a machine shop.

The Ingersoll-Sergeant Drill Co. has let a contract for a machine shop at Easton, Pa.

Foundations will be laid this fall and building resumed in the spring on Geo. B. Sennett's boiler plant, to be built at New Castle, Pa.

The new buildings of the Newcastle (Pa.) Tube Co. will have 40 benches for the drawing of tubing, instead of 20, as at first intended.

The Buescher Mfg. Co., of Elkhart, Ind., whose foundry was totally destroyed by fire, will commence the erection of a new one at once.

The Facer Car Wheel Co., of Perth, Ont., is about to erect works for the manufacture of solid steel car wheels. Stock to the amount of $76,000 has been taken.

The Walworth Run Foundry Co., of Cleveland, has completed negotiations for the purchase of land near New Brunswick, N. J., and work will soon be started on a number of buildings. The company expects to employ a large force at New Brunswick.

The Boyer Machine Co., of St. Louis, Mo., has about completed its new building, a two story brick, nearly covering a lot 70x155 feet. The company manufactures railway speed recorders, pneumatic hammers, and other specialties.

Additions, Enlargements, Removals, Etc.:—

S. W. Jones, is building an addition to his foundry at South Union, Me.

The Vaughn Machine Co., Peabody, Mass., is adding an iron foundry 100x50 feet.

Additions have been made to the Eagle Foundry at Ayer City, Mass., which will double its capacity.

The Pratt & Whitney Co., of Hartford, Conn., is building a new forge shop and an extension to the machine shop.

The Schuylkill Iron Works, of Conshohocken, Pa., are adding to their plant a new mill for the manufacture of cold rolled steel.

The N. & G. Taylor Co., Philadelphia, has been compelled to erect two additional stacks, making a total of 22 tinning stacks now in operation, giving them an output of over 7,000 boxes of 14x20 weekly. An addition is soon to be made to the works for the production of continuous roofing and the manufacture of large tinned sheets.

The Buda Foundry & Mfg. Co., of Harvey, Ill., has just completed extensions to its works which will double the former capacity.

The Harrisburg (Pa.) Roll Works is to be enlarged. An additional lot has been purchased, and a brick building with improved machinery will be put up.

The Berger Mfg. Co., manufacturers of roofing, Canton, O., will erect a large building for its galvanizing department. It will be 52x450 feet and constructed of sheet iron and tile.

General Industrial Notes:—

Sharpsville furnace at Sharpsville, Pa., has been banked pending repairs.

Alice furnace, Sharpsville, Pa., is making a large shipment of Bessemer iron to Joliet, Ill.

Hecla Furnace, Ironton, O., has had a new hearth and bosh put in and started up this week.

The Carondolet Foundry Co., St. Louis, has increased its capital stock from $20,000 to $75,000.

J. R. Gemmill, Sharpsville, Pa., is building a new stack for the Aschman Steel Casting Co., Sharon.

It is proposed to start up the long idle cut nail factory of the Calumet Iron & Steel Co., near South Chicago.

The Attala Foundry & Machine Works of Birmingham, Ala., will be ready for business in about two weeks.

The New Castle Wire Nail Co., which has been running 300 machines, will shut down to clean up stock and make repairs.

It is probable that the Salem Improvement Co. and the Virginia Development Co. will together purchase Salem (Va.) furnace.

The Wheeler & Wilson Sewing Machine Co., Bridgeport, Conn., is running full six days a week for the first time in two years.

The Cambria Iron Co. is reported to be negotiating for a lease of a Hollidaysburg, Pa., furnace that has been inactive for several years.

The Warren, O., mill of the Union Iron & Steel Co., whose product is bar and skelp iron and shafting, is running full in all departments.

The Akron Steam Forge, Elwood, Ind., has just turned out a large piece of shafting. It is 75 feet 10 inches long, 29

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AN INVENTION OF INESTIMABLE VALUE TO THE MINERAL WORLD.

Now ready, machinery and process by which all small or flux ores can be prepared in any shape or size desired, ready for the cupola or furnace, at a very small cost.

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MILWAUKEE FOUNDRY SUPPLY COMPANY,

Successors to D. Fraser Mfg. Co. and Eagle Pattern Wks.

MILWAUKEE, WIS.

inches in diameter and weighed 25 tons. It is for a mammoth Eastern engine.

A quarterly dividend of 1½ per cent on both preferred and common stock has been declared by the Westinghouse Machine Co., payable Oct. 1.

A continuous rod mill, containing 500 tons of metal, has been built for the Illinois Steel Co. by the Lewis Foundry & Machine Co., Pittsburg.

At Haselton, O., the new plant of the Finished Iron & Steel Co., which will manufacture polished shafting, is about completed and ready for machinery.

At Anderson, Ind., the American Wire Nail Co. has taken off the night force in both wire and nail mills, on account of the large supply of nails on hand.

The Muncie Iron & Steel Co., Muncie, Ind., has let a contract recently for new gas wells, in view of the new puddling department recently added.

The stockholders of the Lake Erie Engineering Works of Buffalo, N. Y., have decided to place an additional mortgage of $25,000 on the property of the concern.

A Boston dispatch says that the Subway Commission has accepted the bid of the Pennsylvania Steel Co. to furnish 1,200 tons of special steel shapes at $58.70 a ton.

The engine room at the Raney & Berger furnace at New Castle, Pa., is being extended to give room for a new blast engine from Wm. Tod & Co., Youngstown, O.

It is now reported that the West Duluth blast furnace has succeeded in getting hard ores and will start making Bessemer pig soon. Its capacity is about 100 tons a day.

The Beaver Falls Steel Works, Beaver Falls, Pa., whose product is plow, spring, cutlery, file and tool steel, have orders ahead for seven months, running night and day.

At Haselton, O., the Andrews Bros. Co. is building a standpipe and putting in two new engines with which to pump the water from the river and supply the mill and furnace.

At Elgin, Ill., Elgin National Watch Co. will operate its factory six days a week instead of five as heretofore. This is made necessary by an increase in the demand for watches.

When the bar mill and muck mill engines are completed at the Union Rolling Mill, Cleveland, the company will be prepared to run all furnaces. This has not been done since July, 1893.

The plant of the Milwaukee Malleable Iron Co. has been sold to E. J. Evans, A. J. Frame and other Waukesha people. The plant was removed from South Milwaukee to Waukesha, Wis., about a year ago.

The new car barn for the Hartford Street Railway Co., of Hartford, Conn., will be designed and built by the Berlin Iron Bridge Co., of East Berlin, Conn. The whole construction is to be of steel and fire-proof.

At a meeting of the Harvey Steel Co., of Harvey, Ill., the following directors were elected: Granger Farwell, Geo. P. Jones, J. H. Smith, N. K. Fairbank, D. B. Lyman, Geo. A. Follansbee, Morris Sellers, G. B. Shaw, F. H. Revell, G. J. M. Porter. The officers are: President, Granger Farwell; vice-president, Geo. P. Jones; secretary, J. H. Smith.

The Pennsylvania Tube Co., of Pittsburg, has leased a lap weld furnace from the Pittsburg Tube Co., whose works are adjoining. The annual capacity of 150,000 tons will be increased considerably by this arrangement.

The Birmingham (Ala.) Rolling Mill Co.'s new 26-inch fire bed mill, with 60-inch rolls and additional light sheet mill, will be driven by a 30x60 Corliss engine with a 100,000-pound fly-wheel. Both mills will be completed by Oct. 1.

The Wright Engine Works of Newburg, N. Y., have been incorporated with the following directors: James McClennahan, Samuel McMillan, Thomas Diamond, William J. Fryer and W. G. McCrea, all of New York City. The capitalization $200,000.

The 119-inch plate mill at the Homestead works of the Carnegie Steel Co. turned out 8,091 tons of finished plate in August. The largest in 12 hours work was 294 tons and the best in 24 hours was 498 tons. Total shipments 8,195 tons mostly ½-inch plates.

The Illinois Steel Co. is making arrangements to start its North Chicago Steel Works, which have been idle for many years. These works will manufacture rails and will relieve some of the pressure on the company's other mills, enabling them to turn out more billets.

Car building: The Canadian Pacific car shops at Perth, Ont., have an order for 100 box cars. The Erie Car Works, Erie, Pa., have received an order for 50 gondola coal cars. The Barney & Smith Mfg. Co., Dayton, O., has an order for 200 gondola cars for the Washington Coal & Coke Co., of W. Va.

The Cameron Furnace Co., of Middletown, Pa., owner of the original Cameron furnace, has been reorganized and will probably operate one of the idle furnaces. The new officers are: President, S. C. Young; secretary, W. H. Ulrich; treasurer, A. H. Reider; directors, Hon. J. D. Cameron, W. H. Ulrich, J. S. Strickler, S. C. Young and Joseph Landis.

At Sheffield, Sept. 11, the organization of the Spathite Iron Co., of Alabama was completed. The incorportors are Thos. Sharp, H. W. Buttorff and Wm. Livingston, of Nashville, and Hon. Thos. R. Rouhlac, of Sheffield. The object of this organization is to arrange the affairs of the old Spathite Iron Co., of Tennessee, and put a larger blast furnace capacity on the production of this iron.

Several blast furnace companies are interested in a new purchase of limestone territory near Edensburg, Pa., just closed by M. A. Hanna, of Cleveland; Frank Buhl, of Sharon, Pa.; C. N. Schmick, of Leetonia, O., and Upson A. Andrews, of Pittsburg. It promises to develop one of the best limestone quarries in that section. A $20,000 tramroad is being built to connect with the Pennsylvania Road.

Success continues to attend the operations of the Whiteley Malleable Castings Co., Muncie, Ind., in the melting of iron by the use of natural gas. They have recently tested some of their malleable castings designed for car coupler use. Test

bars that were required to stand three blows from a weight of 1,640 pounds dropped 10 feet and two blows with a drop of 15 feet, were given three additional blows with the second drop without effect.

There has been unusual activity in the formation of new Amalgamated Association lodges since the Cleveland convention. Among new lodges recently organized or chartered are: Morewood tin plate works at Gas City, Ind.; at the tin plate works at Atlanta, Ind.; Kimberly mills at Sharon and Greenville, Pa.; Anchor mills, Newport, Ky.; Maumee rolling mill, East Toledo, O., and the Anderson, Ind., tin plate works.

At Pittsburg, the Brier Hill Iron & Coal Co., of Youngstown, filed answer to a suit by Geo. T. Barns, who claimed $1,350, the difference between the market price and the contract price of 300 tons of Bessemer pig. The company say they contracted to ship Barnes's order to a Western firm. He afterward directed them to ship to the Carbon Steel Co., of Pittsburg, one of their own customers. It had been agreed he was not to interfere with their agents, and they refused and canceled the contract. They deny any liability.

A Wall Street Journal makes this comment on the iron stocks: "Friends of Tennessee Coal & Iron, Colorado Fuel & Iron, Illinois Steel and Minnesota Iron say that no matter what the rest of the market does these stocks are perfectly safe to hold for materially higher prices this year. They may react a little if the market is weak, but the earnings of the properties and the orders booked ahead are such that all four stocks will be in active demand from inside interests and there can be no reaction of consequence until all of them are a good many points higher."

E. E. Keller, of the Westinghouse Machine Co., has just returned from Europe, where he succeeded in obtaining for his company all American rights in a very important foreign invention. This is the Parsons steam turbine. It is just what its name implies, a turbine or rotating wheel, like a water-power wheel, only that it is driven by steam instead of by water. The steam is transmitted direct from the boiler against the turbine, striking it with great force. The turbine rotates and is connected by shafting with the electric generator, which is to furnish the power desired. It is claimed for this kind of turbine that each 15 pounds of water in the boiler will generate one electric horse-power, which is a very remarkable efficiency.—[Pittsburg Dispatch, Sept. 11.

H. E. Collins & Co., Bank of Commerce Building, Pittsburg, sole sales agents for the Cahall vertical water tube boiler, manufactured by the Aultman & Taylor Machinery Co., of Mansfield, O., report the following recent sales of Cahall boilers for the use of blast furnace gas: Illinois Steel Co., Joliet, Ill., 500 h. p.; Douglass Furnace Co., Sharpsville, Pa., 250 h. p.; Salem Iron Co., Leetonia, O., third order, 500 h. p.; Shoenberger Steel Co., Pittsburg, fifth order, 500 h. p.; Sharon Iron Co., Sharon, Pa., second order, 500 h. p. Orders for boilers for the utilization of waste heat from heating surfaces are: St. Louis Stamping Co., Granite City, Ill., second order, 175 h. p.; National Tube Works Co., McKeesport, Pa., 200 h. p.; Mahoning Valley Iron Co, Youngstown, two orders, 600 h. p. In addition the following recent orders have been secured for the direct fired type of Cahall boiler: Wm. Tod & Co., Youngstown, O., 250 h. p.; Armstrong Cork Co., Pittsburg, 250 h. p. Messrs. Collins & Co. have just issued a card containing a list of repeated orders received for Cahall boilers, the length of the list showing the great favor these boilers have found.

AT Pittsburg the common council has approved the awards made to the E. P. Allis Co. for pumping engines. The contract is worth $100,000 and another bid was $15,000 less, but the company making it was said to be far behind on a contract it now has with Pittsburg.

ON Aug. 31 stocks of tin plates at Swansea were 112,599 boxes, against 311,578 boxes on the same date last year. Virtually all the Welsh producers have granted the demand of their men for the higher wages of the 1874 scale. Imports at New York lately have ranged about 15 per cent less than in the corresponding period of last year. The demand in this country for tin plate for cans, for miscellaneous tinware and for roofing, has been below expectations and New York prices have dragged. Bessemer coke IC plates, 100 lbs, 14 x 20, are still quoted $3 65 at New York.

WILLIS SHAW.

Steam Pumps, Boilers, Hoisting Engines, Mine Cars, Trucks, Barrows, Corrugated Roofing, Mill, Mining and Contractors' Supplies.

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Write for prices. CHICAGO, ILL.

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(Fan Blast System.)

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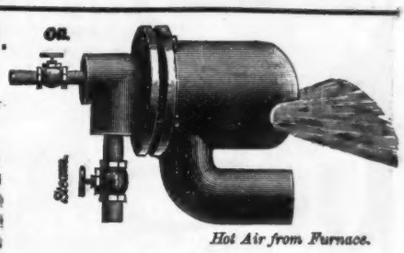
Gen'l Offices, 31 and 32 Cordova Bldg.,
INDIANAPOLIS, IND.

Acknowledged the best for Boilers, Forges, Furnaces, Ovens, etc. Write for Catalogues.

BURNER NO. 6.



BURNER NO. 4

BRANCHES. { 1401 Monadnock Block. Chicago. 21 and 23 Fremont st., San Francisco.

NOTE.—If you are using oil as fuel, and are not getting good results, we would be pleased to send you our burners on trial. The oil in our burners can be atomized by either steam or air.

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Manufacturers of the following well-known

American Bright Tin

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Venus, Hercules, Pioneer,
Flag, Victor, Stag,

"PENNSYL" Old Method,
"ALDERLY" (American.)
"LEOMINSTER," Ext. Coated,
"ALDERLY" (American.)

Also selling agents of the well-known

GILBERTSON'S OLD METHOD

GUMMEY, McFARLAND & CO.,
PHILADELPHIA.

McNeil's Patent Balanced Charging Barrow.

AUTOMATIC DUMP.
ONE MAN CAN HAUL A TON.

Especially adapted for use in Charging Cupolas, Handling Hot Coke, Hauling Coal, Ashes, Etc.

Ten Sizes with CAPACITIES from FIVE to THIRTY BUSHELS.

—ALSO—

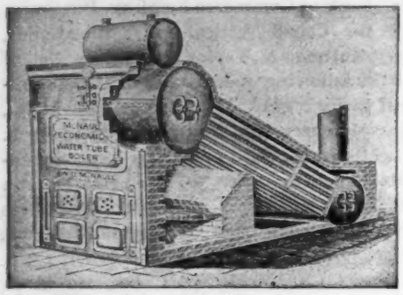
Akron Tubular Steel Wheelbarrows.

THE AKRON CULTIVATOR CO., Manufacturers,
AKRON, O.

Bolt and Nut Works.

THE UPSON NUT CO., Manufacturers of Nuts Washers, Carriage, Machine, Plow, and Elevator Bolts, Coach Screws, etc.

THE McNAULL SAFETY, ECONOMIC WATER TUBE BOILERS



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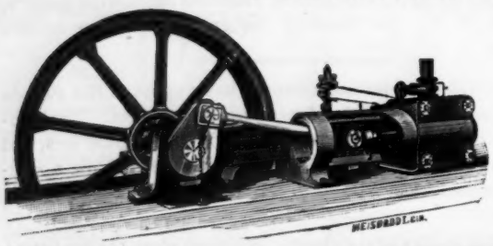

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Simple and Compound.
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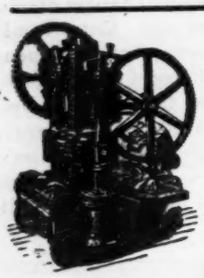

Triplex Power and Electric Pumps, Rotary Pumps, Artesian Well Steam Pumps, Hydraulic Boiler Test Pumps, etc.
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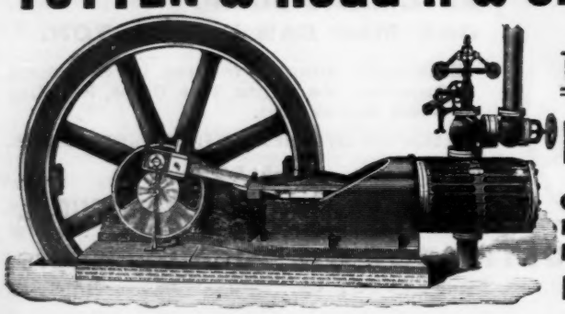

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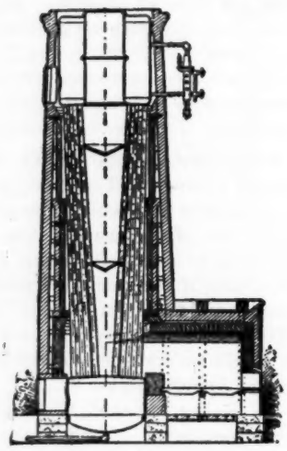

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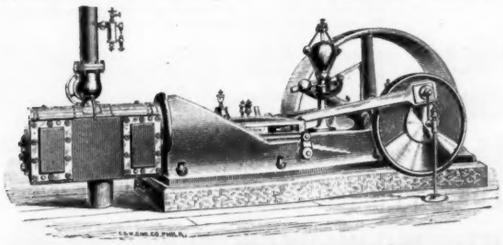

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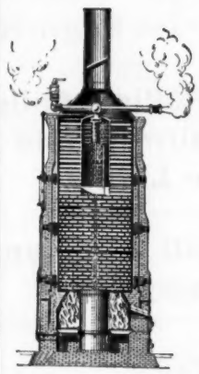

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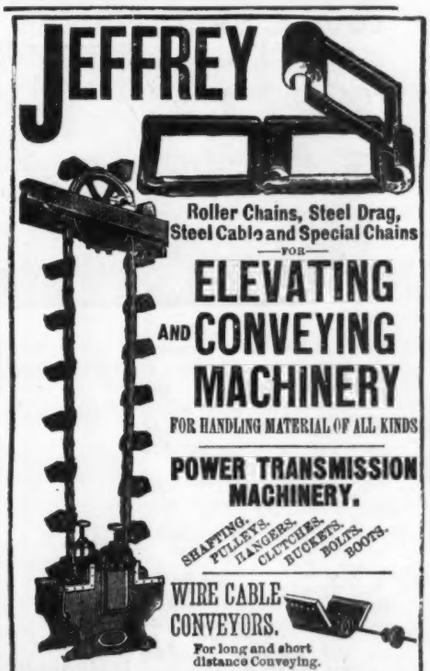

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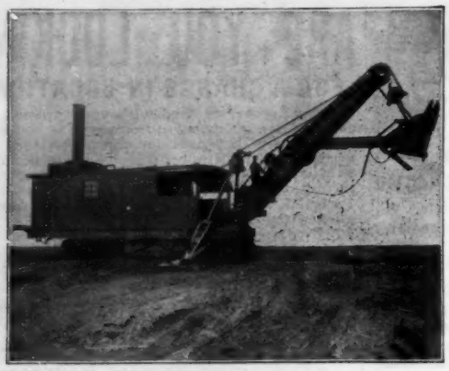

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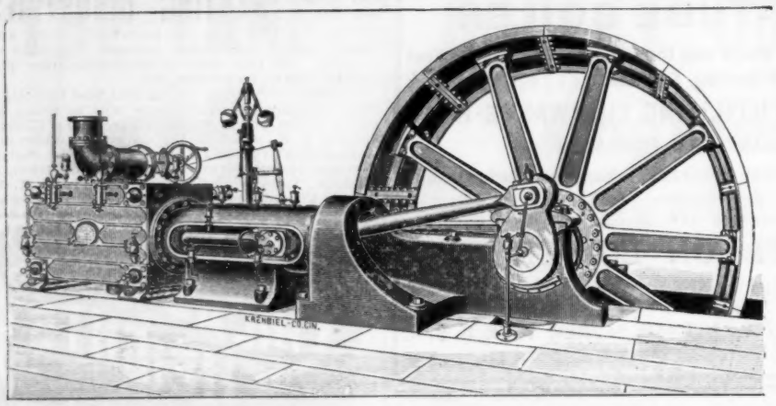

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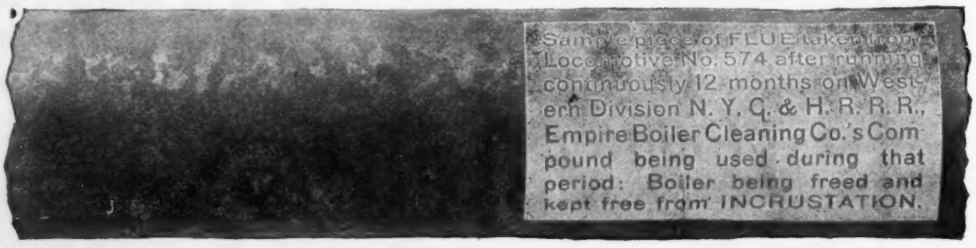
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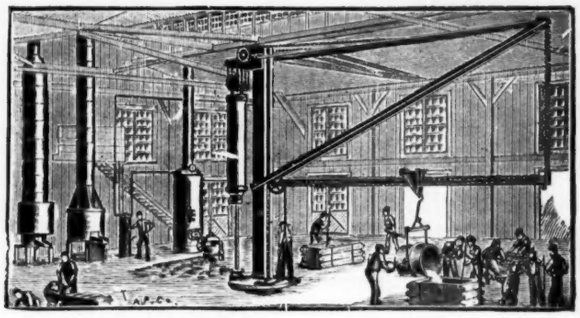

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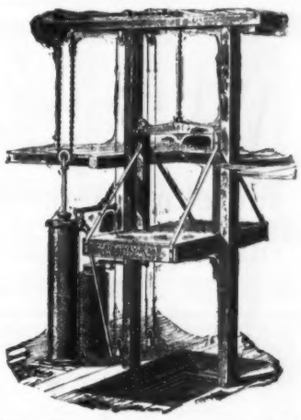

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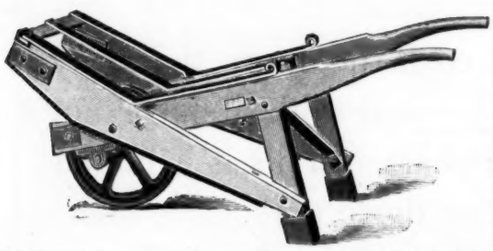

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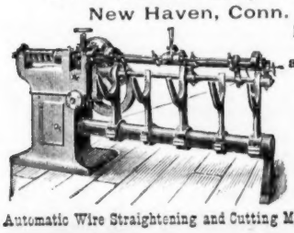

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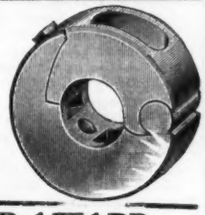

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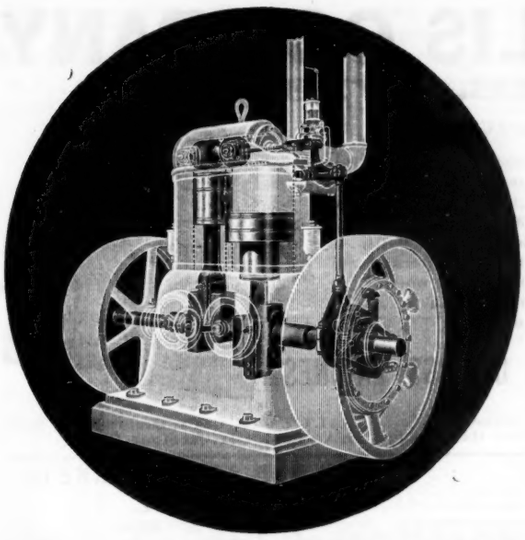

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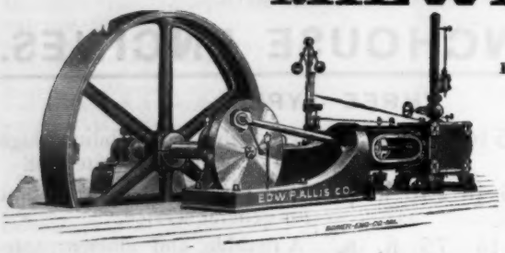

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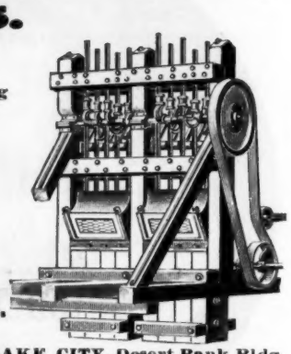

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	PAGE
Acme Mineral Nugget Co.	16
Adt & Son, John	23
Aitchison, Rob't Perforated Metal Co.	27
Akron Cultivator Co.	17
Allis & Co., Edward P.	26
American Fire Brick & Clay Co.	15
American Hoist & Derrick Co.	31
Armstrong Bros. Tool Co.	1
Battle Creek Steam Pump Co.	18
Bement Miles & Co.	2
Besly & Co., C. H.	32
Bethlehem Iron Co.	31
*Berger Mfg. Co.	—
*Bertsch & Co.	—
Bickford, H.	32
Brown, Edward	31
Buckeye Mfg. Co.	2
Bucyrus Steam Shovel & Dredge Co.	20
Buffalo Forge Co.	1
Burns Hydro-Carbon Burner Co.	17
Byers Machine Co., John F.	31
Cady Mfg. Co.	27
Canadian Copper Co.	1
Catterson, Geo. N.	21
Central Iron & Steel Co.	31
Chase Machine Co.	2
Chicago Chemical Solution Co.	23
Chicago Heights Land Ass'n	19-21-23-26-29-30
Clearfield Fire Brick Co.	31
Cleveland & Buffalo Transit Co.	29
Cleveland City Forge & Iron Co.	1
Cleveland Electrotype Foundry	26
Cleveland Rolling Mill Co.	31
Cleveland Twist Drill Co.	32
Coffman Coke Co., W. H.	28
*C. M. & St. P. Ry.	—
Cole, J. Wendell	32
Collins & Co., H. E.	18
Condit-Fuller Co.	29
Consolidated Roofing Works	32
Craig Ridgway & Son	21
Crook Bros.' Co.	28
Deming Co.	18
Detroit & Cleveland Steam Navigation Co.	29
Diamond Machine Co.	28
Dickman & MacKenzie	2
Dixon, Jos. Crucible Co.	22-27
Dover Fire Brick Co.	31
Eclipse Electrotype & Engraving Co.	29
Emmerton, F. A.	2
*Empire Paint & Roofing Co.	—
Empire Boiler Cleaning Co.	20
Enterprise Boiler Co.	32
*Fix Sons	23
Fleharty, J. H. & Co.	31
†Foos Gas Engine Co.	—
Forster, Hawes & Co.	1
Fox Machine Co.	1
Fraser, John	23
*Freeman & Sons, S.	—
*Fulton Steam Boiler Wks. & Fdy. Co.	—
†Garden City Sand Co.	—
Gerlach, Peter & Co.	29
Gobeille Pattern Co.	21
Gouverneur Machine Co.	23
*Greenfield, W. G. & G.	—
Gummey, McFarland & Co.	17
Hamilton Foundry & Machine Co.	1
Harrington & King Perforating Co.	30
Hartford Steam Boiler Insp. & Ins. Co.	18
†Haskins Iron Works	—
Hazelton Boiler Co.	19
Hill, Clarke Co.	23
*Hodell, H. H. & Co.	—
Holland, Wm.	31
Hooven, Owens & Rentschler Co.	20
Huyett & Smith Mfg. Co.	17
Hyde Bros. & Co.	2
Illinois Central R. R.	19
Illinois Screw Co.	1
Iron Clad Paint Co.	27
Iron & Steel Laboratory Co.	23
Jeffrey Mfg. Co.	19
Jessop & Sons, Ltd., Wm.	28
Jones Foundry Co., W. A.	1
Jopling & Escobar	23
Johnson Co., The	28
Junction Iron & Steel Co.	2
†Knight & Son, H. W.	—
Kurtz & Buhrer Foundry Co.	1
Lane & Bodley Co.	18
Lansing Wheelbarrow Co.	21
Link Belt Machinery Co.	18
Lloyd Booth Co.	30
Long & Allstatter Co.	27
*Lodge & Shipley Machine Tool Co.	32
Marion Steam Shovel Co.	31
McNaull & Co.	18
Moyes, L. M.	21
Mercantile Trade List Supply Co.	21
Milwaukee Foundry Supply Co.	16
Moore Mfg. & Foundry Co.	1
National Engraving Co.	23
Newell Bros.	1
North American Metaline Co.	32
Oak Hill Fire Brick & Coal Co.	28
Oglebay, Norton & Co.	29
Ohio Sand Co.	32
Otto Gas Engine Co.	32
Pittman, C. K.	2
Pollock, Wm. B. & Co.	2
Pope, E. C.	29
Prentiss Tool & Supply Co.	23
Q. & C. Co	32
Reese, Hammond & Co.	32
Rhoads & Sons.	23
Salem Wire Nail Co.	21
Scaife & Sons, Wm. B.	1
‡Sharon Fire Brick Works.	1
Sharpless & Winchell	19
Shaw, Willis	17
†Shaw Electric Crane Co.	—
Shiffler Bridge Co.	29
Smith, Sam'l J.	32
Southwark Foundry & Machine Co.	19
Sterling Emery Wheel Mfg. Co.	30
Stevens, F. B.	32
Stilwell-Bierce & Smith-Vaile Co.	2
Stowe, Fuller & Co.	15
Sturtevant Co., B, F.	2
Sykes Iron Roofing Co.	23
Tanite Co.	32
Taylor & Boggis Foundry Co.	1
Thurman Fuel Oil Burner Co.	17
Tod, Wm. & Co.	30
Toledo Machine & Tool Co.	31
Totten & Hogg I. & S. F'dry Co.	18
Union Electric Co.	31
Union Mining Co.	15
United States Heater Co.	32
Universal Telephone Co.	1
Upson Nut Co.	17
Vulcan Iron Works.	20
Wertheim, Ed.	1
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If you are seeking a new location it will pay you well to investigate the merits of our proposition.
Chicago Heights Land Association
M. H. KILGALLEN, Gen'l Mgr. CHICAGO

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$3.75@ 4.50
No. 1 Bessemer hematite	3.00@ 3.50
Hematites No. 1 non-Bessemer	2.00@ 2.50
No 1. Specular, non-Bessemer	2.50@ 3 00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$17 50@ 17 75
No. 1 Strong Foundry	14 75@ 15 25
No. 2 Strong Foundry	14 00@ 14 25
No. 1 Gray Forge, red short	13 50@ 13 75
No. 2 Gray Forge, neutral	12 50@ 13 00
No. 1 American Scotch	15 40@ 15 65
No. 2 American Scotch	14 40@ 14 65
Lake Superior Charcoal	13 50@ 14 00
PITTSBURG:	
No. 1 Foundry	$14 50@ 14 75
No. 2 Foundry	13 75@ 14 00
Gray Forge	13 50@ 13 75
White and Mottled	12 00@ 12 50
Warm Blast Charcoal	16 00@ 17 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	17 50@ 17 75
CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$14 50@$15 50
Local Coke Foundry No. 1	14 00@ 15 00
Local Coke Foundry No. 2	13 50@ 14 50
Local Coke Foundry No. 3	13 00 .....
Local Scotch Foundry No. 1	14 00@ 14 50
Local Scotch Foundry No. 2	14 00@ 14 50
Local Scotch Foundry No. 3	12 50@ 13 00
Southern Coke No. 1	10 70@ 11 00
Southern Coke No. 2	14 00 .....
Southern Coke No. 3	13 65 .....
Southern No. 1 Soft	14 15 .....
Southern No. 2 Soft	13 90 .....
Southern Silveries No. 1	15 25@ 15 75
Southern Silveries No. 2	15 15 .....
Jackson Co. Silveries	15 50@ 16 00
Ohio Silveries No. 1	15 00@ 15 50
Ohio Silveries No. 2	14 50@ 15 00
Ohio Strong Softeners	15 00@ 15 50
Alabama Car Wheel	17 00@ 17 50
Malleable Bessemer	.....
Coke Bessemer	.....
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$13 00@$ .....
Southern Coke No. 2 and No. 1 Soft	12 25@ .....
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	14 00@ 14 50
Jackson County Silvery No 1	14 00@ 15 00
Southern Coke, Gray Forge	12 50
" " Mottled	12 25@ 12 50
Standard Alabama Car Wheel	15 75@ 16 25
Tennessee " "	14 50@ 15 00
Lake Superior " "	15 50@ 16 50

OLD RAILS AND SCRAP METAL.

	GROSS TONS
Old iron rails	$17 50
Old steel rails	14 50
Old Car Wheels	11 50
	NET TONS
No. 1 R. R. wrought scrap	$15 00
Mill scrap	12 00
No. 1 Machine cast scrap	11 00
Iron axles	21 00
Axle turnings	10 50
Wrought turnings (free from cast)	9 50
Cast borings	8 50
Uncut wrought iron boilers	7 00
Steel boiler plates	12 50
Grate bars	7 50
Pipes and flues (clean)	10 50
Tank iron	10 50
Hoop and band iron	8 00
Sheet iron	8 00
Wrought drillings	9 00
Malleable iron	8 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.75c@1.85c
Angles	1.70c
Tees	1.80c@1.90c
Universal Plates	1.90c
Sheared Plates	2.00c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 60
4½ to 6 by ⅜ to 1 inch	1 65
1½ to 6 by 1½ to 2 inch	1 80
1¼ & 1¾ by ⅜ to ¾ inch	1 65
1 & 1¼ by ⅜ to ¾ inch	1 70
⅝, ¾, ⅞, by ⅜ to ⅝ inch	1 80

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

THE CADY MFG. CO.

18, 20 and 22 Johnson St., CLEVELAND, O.

SEND FOR OUR NEW CATALOGUE OF Power Presses, Drop Hammers, Punches and Shears, Wire Working and Special Machinery.

PERFORATED METALS

OF ALL KINDS FOR

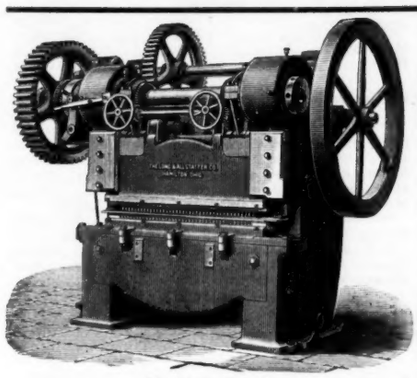
MILLING MINING AND AGRICULTURAL MACHINERY,

PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.

LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.

THE ROBERT AITCHISON. PERFORATED METAL CO.,

OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.



Multiple Punch.

—THE—

Long & Allstatter Co.

HAMILTON, O., U. S. A.

Manufacturers of Belt, Steam and Electrically driven

Power Punches and Shears

for all kinds of Boiler, Tank and Structural Iron Work, Rolling Mills, Locomotive Shops, Car and Wagon Shops, Plow Shops, etc. Send for catalogue.

A. H. LEITCH, PREST. JOHN C. LEITCH, SEC. AND TREAS.

WESTMORELAND FIRE BRICK CO. MANUFACTURERS OF HIGH GRADE FIRE BRICKS.

PITTSBURG, PA.

Works and Mines, Westmoreland, Pa.

DIXON'S PERFECT LUBRICATING GRAPHITE.

The most Marvelous Lubricant Known.
Used Dry, or Mixed with Water, Oil or Grease

NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.

An Interesting and Instructive Pamphlet will be sent Free of Charge.

JOS. DIXON CRUCIBLE CO. Jersey City, N. J.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

Round and Square.

1 to 1⅞ inch	1 60
2 to 2⅝ inch	1 80
2¾ to 3¼ inch	1 75
3⅜ to 4 inch	2 10
4¼ to 4½ inch	2 70
4¾ to 5 inch	2 90

Oval.

⅜ to 1¼ inch	1 80
⅜ to ¾ inch	1 80
½	2 00
⅝	2 20

Half Oval and Half Round.

1¼ to 3 inch	2 15
⅜ to 1½ inch	1 95
⅜ to ¾ inch	2 20
½	2 35
⅝	3 45

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 70
1 to 1⅜ by ¼ and 5-16 inch	1 75
¾ to ⅞ by ¼ and 5-16 inch	1 85
½ to ⅝ by ¼ and 5-16 inch	2 10

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	2 15
1 7-16 to 2, No. 17, 18 and 19	2 20
1 7-16 to 2, No. 20	2 30
1 7-16 to 2, No. 21	2 40
1 7-16 to 2, No. 22	2 50
1⅛ to 1⅜, No. 13, 14 and 15	2 20
1⅛ to 1⅜, No. 16, 17 and 18	2 25
1⅛ to 1⅜, No 19 and 20	2 30
1⅛ to 1⅜, No. 21	2 40
1⅛ to 1⅜, No. 22	2 50
15-16 and 1 inch, No. 13, 14 and 15	2 15
15-16 and 1 inch, No. 16, 17 and 18	2 30
15-16 and 1 inch, No. 19 and 20	2 40
15-16 and 1 inch, No. 21	2 50
15-16 and 1 inch, No. 22	2 60
⅞, No. 13, 14 and 15	2 40
⅞, No. 16, 17 and 18	2 50
⅞, No. 19 and 20	2 60
⅞, No. 21	2 70
⅞, No. 22	2 80
13-16, No. 13, 14 and 15	2 50
13-16, No. 16, 17 and 18	2 60
13-16, No. 19 and 20	2 70
13-16, No. 21	2 80
13-16, No. 22	2 90
¾, No. 13, 14 and 15	2 60
¾, No. 16, 17 and 18	2 75
¾, No. 19 and 20	2 85
¾, No. 21	2 95
¾, No. 22	3 05
11-16, No. 13, 14 and 15	2 85
11-16, No. 16, 17 and 18	2 90
11-16, No. 19 and 20	3 00
11-16, No. 21	3 10
11-16, No. 22	3 20
11-16, No. 23	3 30
⅝, No. 13, and 15	2 90
⅝, No. 16, 17 and 18	3 00
⅝, No. 19 and 20	3 10
⅝, No. 21	3 20
⅝, No. 22	3 30
⅝, No. 23	3 40
9-16, No. 13, 14 and 15	3 10
9-16, No. 16, 17 and 18	3 20
9-16, No. and 20	3 30
9-16, No. 21	3 40
9-16, No. 22	3 50
9-16, No. 23	3 60
7-16 and ½ inch, No. 13, 14 and 15	3 30
7-16 and ½ inch, No. 16, 17 and 18	3 40
7-16 and ½ inch, No. 19 and 20	3 50
7-16 and ½ inch, No. 21	3 60
7-16 and ½ inch, No. 22	3 70
7-16 and ½ inch, No. 23	3 80
⅜, No. 13, 14 and 15	3 80
⅜, No. 16, 17 and 18	3 90
⅜, No. 19 and 20	4 00
⅜, No. 21	5 31
⅜, No. 22	4 40
⅜, No. 23	4 55

Light Band.

1½ to 6 by ⅛ to 3-16 inch	1 90
1½ to 6 by Nos. 11 and 12	1 95
1 to 1¾ by ⅛ to 3-16 inch	1 95
1 to 1¾ by Nos. 11 and 12	2 00
⅞ and 13-16 by ⅛ to 3-16 inch	2 10
⅞ and 13-16 by Nos. 11 and 12	2 15
¾ and 11-16 by ⅛ to 3-16 inch	2 20
¾ and 11-16 by Nos. 11 and 12	2 25
⅝ and 9-16 by ⅛ to 3-16 inch	2 35
⅝ and 9-16 by Nos. 11 and 12	2 40
½ by ⅛ to 3-16 inch	2 50
½ by Nos. 11 and 12	2 55

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 10
⅞ inch, " " " " 13 and 14	2 20
¾ inch, " " " " 11 and 12	2 25
¾ inch, " " " " 13 and 14	1 55

Sheet Iron.

No. 10	2 10
No. 12	2 20
No. 14	2 25
No. 15-17	2 35
No. 18	2 50
No. 20	2 65
No. 22-24	2 75
No. 25-26	2 85
No. 27	2 95

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 00
Shell	2 15
Flange	2 25
Marine Flange	2 60
Fire Box	3 70

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts.	lbs.
1 to 2 in. inclusive	08	
9-16 to ⅞ in. "	08½	

—FOR—

JESSOP'S STEEL Tools, Drills, Dies, etc.

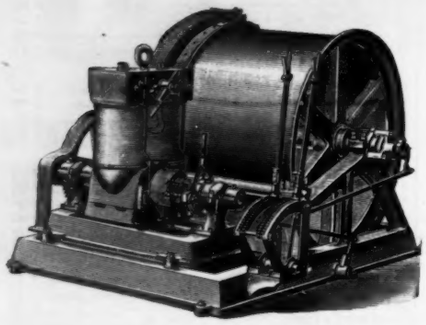
Established over a Century ago. Manufactory, SHEFFIELD, ENGLAND.

CHIEF AMERICAN OFFICE, 91 JOHN ST., NEW YORK.

WM. JESSOP & SONS, Limited.

"Medal—World's Columbian Exposition, 1893."

All sizes carried in stock by The W. Bingham Co., Cleveland, Ohio.



HOISTING MACHINERY for Mining, Quarrying, Coal Handling, Pile Driving, Bridge Building, Log Hauling and for general Contractors' Use. Improved Electric Hoists, single and double Patent Friction Drum, compound, geared with brakes and reversible for general Hoisting. Mining Purposes and Suspension Cable Ways.

Send for Illustrated Catalogue giving full description, etc.

CORRESPONDENCE SOLICITED.

W. A. CROOK BRO'S CO.,

117-123 Pioneer St.,

Salesrooms, 143 Liberty St., N. Y. Newark, N. J.

W. H. COFFMAN COKE CO.

BLUEFIELD, W. VA.

GENERAL FACTORS AND SHIPPERS OF

POCAHONTAS FLAT-TOP COKE.

So low in ash that it requires no fluxing for foundry purposes. Our foundry and furnace coke was awarded the first premium at the World's Fair in 1893.

AVERAGE ANALYSIS OF COKE.

Moisture	00.196	Sulphur	00.677
Fixed Carbon	93.625	Ash	05.004
Volatile Matter	00.494		

Foundry, Furnace and all sizes of crushed coke. Guaranteed lower in Sulphur than any other commercial coke

WHO IS THE "NEXT"?

We have sold our goods to 50 bicycle manufacturers, in the last 30 days, besides supplying our regular trade for Grinding and Polishing Machinery.

"First come is first served," and we would like to serve you "first," but you must send along your order.

We make all varieties of the best Grinding and Polishing Machinery.

Diamond Machine Company,

Home Office and Wks., 623 to 641 Atwells Ave., Providence, R. I. Western Branch, Chicago, Ill.

STEEL CASTINGS

OF EVERY DESCRIPTION

Made from Best Open-Hearth Steel.

SEND FOR ESTIMATES.

THE JOHNSON COMPANY, Johnstown, Pa.

Compare the analysis of the clay used in our.....

"O.K." CROWN

High Grade Fire Brick, with that used by ANY other Fire Brick-maker, and you will understand why, they have stood the TEST for TWENTY-TWO LONG YEARS

Our Prices are Just ...Right...

OAK HILL FIRE BRICK AND COAL CO.

MANUFACTURERS

OAK HILL, OHIO

7-16 to ⅜ and 2¾ to 3 in.	.09
3¼ to 4 in.	.09½
⅜ to 11-16 and 4½	.10
½ to 6 in.	.10½
⅝ to 9-32 and 6½ to 7 in.	.11
1 in	.13

Flats.

	cts. lbs.
2 to 9-16 in. wide by 2 to ⅝ thick	.8

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 50
Open-hearth Tire	"	1 80
Open-hearth Spring	"	2 20
Sleigh Shoe	"	1 90
Toe Calk	"	2 10
Cutter Shoes, tapered and bent	"	2 20

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

⅛, ⅜, 11-16 and ¾ inches diameter	3 30
Bridge ¼, ⅜, 11-16 and ¾ inch diam	3 00

Wrought Pipe and Boiler Tubes.

Lap weld black, base	dis. 67
Butt " " "	dis. 57
Lap " galv. "	dis. 55
Butt " " "	dis. 52
Boiler tubes 2½" and smaller	dis. 65 and 5
Boiler tubes 2½" and larger	dis. 67½ and 5
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis35
Horton's Universal	dis40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

Emery.

	No. 4 to No. 54 46 gr.	No. 54 to Flour, C. F 150 gr.	F. FF.
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Grant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 55
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

SHIFFLER BRIDGE COMPANY,

BUILDING DEPARTMENT.

SPECIALTIES: STEEL AND IRON BUILDINGS FOR ROLLING-MILLS, TIN PLATE PLANTS, STEEL WORKS, FOUNDRIES, FACTORIES, ROOF TRUSSES, GIRDERS, COLUMNS, BEAMS, CORRUGATED IRON, ETC.

Main Office and Works:
48th Street and A. V. Ry.
PITTSBURG, PA.

Branch Offices:
1123 Betz Building, Philadelphia, Pa.
65 Dexter Building, Chicago, Ill.
238 Lumber Exchange, Minneapolis, Minn.

FOR YOUR OUTING GO TO PICTURESQUE MACKINAC ISLAND.

ONE THOUSAND MILES OF LAKE RIDE AT SMALL EXPENSE.

Visit this Historical Island, which is the grandest summer resort on the Great Lakes. It only costs about $13 from Detroit; $15 from Toledo; $18 from Cleveland, for the round trip, including meals and berths. Avoid the heat and dust by traveling on the D. & C. floating palaces. The attractions of a trip to the Mackinac region are unsurpassed. The island itself is a grand romantic spot, its climate most invigorating. Two new steel passenger steamers have just been built for the upper lake route, costing $300,000 each. They are equipped with every modern convenience, annunciators, bath rooms, etc., illuminated throughout by electricity, and are guaranteed to be the grandest, largest and safest steamers on fresh water. These steamers favorably compare with the great ocean liners in construction and speed. Four trips per week between Toledo, Detroit, Alpena, Mackinac, St. Ignace, Petoskey, Chicago, "Soo," Marquette and Duluth. Daily between Cleveland and Detroit, and Cleveland and Put-in-Bay. The palatial equipment makes traveling on these steamers thoroughly enjoyable. Send for illustrated descriptive pamphlet. Address A. A. SCHANTZ, G. P. A., D. & C., Detroit, Mich

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	†12:45 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	† 3:25 pm	† 9:50 am
Hudson and Ravenna	* 5:00 pm	* 8:25 am
Philadelphia and New York	*11:10 pm	* 5:25 am
Baltimore and Washington	*11:10 pm	* 5:25 am
Alliance and Pittsburgh	*11:10 pm	* 5:25 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:40 am	* 5:15 pm
Akron and Columbus	* 8:40 am	*5:15 pm
Akron, Columbus & Zanesville	†12:45 pm	†12:10 pm
Akron and Orrville	† 3:25 pm	† 9.50 am
Columbus and Cincinnati	* 8:00 pm	* 6:55 am

Valley Ry.

Depot foot of So. Water St.
City Office 137 Superior St.

	Arrive.	Depart.
Akron & Canton	*6:30 P M	*7:10 A M
Akron, Canton & Valley Jctn.	*10:10 A M	*3:15 P M
Valley Jctn. & Way Stations	†6:30 P M	†7:10 A M
Akron, Canton & Chicago	*8:00 A M	*6:30 P M
Wooster and Chicago	†2:45 P M	†11:00 A M
Wooster		†6:30 P M
Akron, Canton & Marietta	†2:45 P M	†11:00 A M
Steubenville, Wheeling, Washington, D. C., and Baltimore	†2:45 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule Drawing Room cars between Cleveland and Chicago.

TELEPHONE 1916

ECLIPSE MUSIC PLATES ELECTROTYPE ENGRAVING CO.

58 FRANKFORT ST. CLEVELAND, O.

THE CONDIT-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, . OHIO.

Oglebay, Norton & Co.,

LAKE SUPERIOR IRON ORES.

— AGENTS —

The Spanish-American Iron Co.,
Santiago, Cuba.
CLEVELAND. PHILADELPHIA.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron AND METALS.

Cleveland - Ohio.

ESTABLISHED 1854.

PETER GERLACH & CO.,

MAKERS OF

Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.,
Cleveland, Ohio, U. S. A.

$2.50 CLEVELAND TO BUFFALO

Via "C. & B. LINE,"

Commencing with opening of navigation (about April 1st). Magnificent side-wheel steel steamers

"State of Ohio" and "State of New York."

DAILY TIME TABLE.

SUNDAY INCLUDED.

Lv. Cleveland, 6:00 P.M. | Lv. Buffalo, 6:30 P.M.
Ar. Buffalo, 7:30 A.M. | Ar. Cleveland, 7:30 A.M.

CENTRAL STANDARD TIME.

Take the "C. & B. Line" steamers and enjoy a refreshing night's rest when enroute to **Buffalo, Niagara Falls, Toronto, New York, Boston, Albany, 1,000 Islands,** or any Eastern or Canadian point.

Cheap Excursions Weekly to Niagara Falls.

Send 4 cents postage for tourist pamphlet.

W. F. HERMAN, Gen'l Pass. Agt. **T. F. NEWMAN,** Gen'l Manager.
Cleveland, O.

CHICAGO HEIGHTS

The Industrial Centre of Chicago

offers **Free Factory Sites** and other inducements.

If you are seeking a new location it will pay you well to investigate the merits of our proposition.

Chicago Heights Land Association
M. H. KILGALLEN, Gen'l Mgr. CHICAGO

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Chicago Heights Land Association
M. H. KILGALLEN, Gen'l Mgr. CHICAGO

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 60@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....12c
" " " " over 5 lbs.....10c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5⅝	4¾	4	3¼	3½
Hexagon	15⅛	11½	8½	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ¼ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887.....dis 85
Standard Penny Nails, ¼ keg card rate
Car lots.....$2.30
Less than car lots.....$2.50

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ¼ doz.....dis 10@10&10

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 50
Medart Pulleys.....dis 50
Split Wood Pulleys.....dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block.....dis 20

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@5
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 40

Wire.

New List, Apr. 9, 1894

Brass.....dis 40
Copper.....dis 40
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75& 5
" " Nos. 27@36.....dis 75&10& 5
Coppered Nos. 0 to 18, market list.....dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis65& 5
Tinned market Nos. 0 to 18.....dis 57½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ¼ lb dis 30

Wrenches.

Coe's genuine.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanic's.....dis 55&10& 5
Bemis & Call's Combination.....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 25
William's " " .....dis 25
Alligator " " .....dis 40

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The plant consists of a main building of most substantial construction, three stories and attic in height, 385 feet long and 38 feet wide, equipped with the most modern and complete machinery, shafting, engines, etc.

In addition and in connection with this building is a large brass foundry 71 by 143 feet, with core rooms attached, smithy, pattern storehouse, iron foundry 102 by 70 feet, pipe foundry 92 by 98 feet, sand sheds, lumber sheds, sheds for finished stock, carpenter's shop, coal and coke shed, boiler and engine houses, ovens, paint shop, woodworking shop 55 by 93 feet, and all other appurtenances necessary to the equipment of a first-class plant.

The plot upon which this plant is located fronts for about 575 feet on Penfield avenue, the principal thoroughfare in Lorain, and is bounded on the other three sides by Kent, Broad and Forest sts

The facilities for transportation to and from the plant are of the best, shippers having the choice of either the Cleveland, Lorain & Wheeling, or the New York, Chicago & St. Louis ("Nickel Plate") railways, in addition to facilities by water.

The city of Lorain is rapidly improving and increasing in population, and has continued to do so throughout, and notwithstanding, the recent financial depression.

Inspection and correspondence is invited. Either of the undersigned will be pleased to afford further information.

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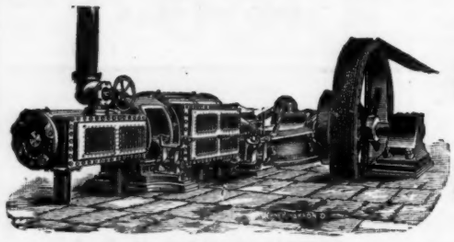

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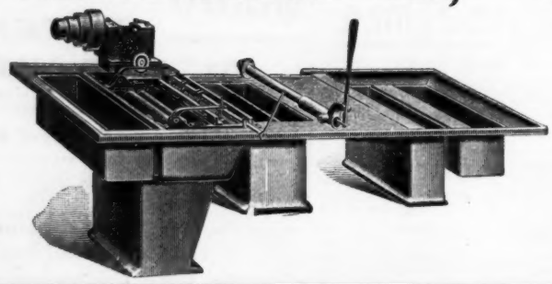

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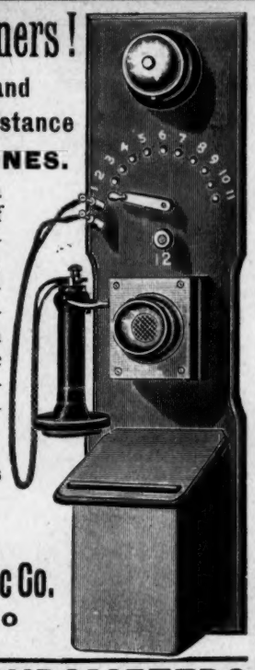

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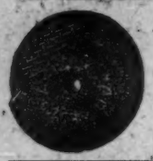

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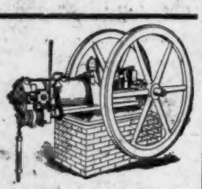

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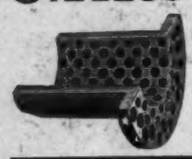

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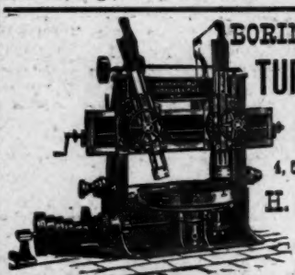

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